Headquarters
Department of the Army
Washington, DC, 5 April 1999

CORPS ENGINEER OPERATIONS (Digital - CD)

1. Change FM 5-100-15, 6 June 1995, as follows:

Remove Old Pages	Insert New Pages
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1-1 through 1-6	1-1, 1-1a, 1-1b, 1-2, 1-3, 1-3a, 1-3b, 1-4, 1-4a, 1-4b, 1-5, 1-5a, 1-5b and 1-6
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2. A bar (|) marks new or changed material.

3. File this transmittal sheet in front of the publication.

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Headquarters
Department of the Army
Washington, DC, 6 June 1995

CORPS ENGINEER OPERATIONS (DIGITAL - COORDINATING DRAFT)

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PREFACE

This field manual (FM) is a guide for the employment of engineer forces in support of a United States (US) Army Force XXI (FXXI) corps. It addresses the role, organization, and command and control (C2) of corps engineers and the conduct of corps-level engineer operations.

The primary users of this FM are the corps commander and his staff, the corps engineer and his staff, engineer units subordinate to the corps engineer brigade, and theater engineer organizations at echelons above corps (EAC). Other users will be engineer organizations supporting maneuver units subordinate to the corps and sister services' commanders and staffs, the United States Army Corps of Engineers (USACE), and government contractors.

The change to this manual provides insights into corps-level digital operations and addresses the application of new or emerging digital technologies that enable information acquisition and handling; operational planning; coordination, synchronization, and integration; tactical decision making; and mission execution. It addresses those FXXI engineer digital systems and initiatives that, while not fielded in their totality, will be used by engineer units during the execution of engineer missions or simulated during warfighter exercises for training purposes. Emerging digital tactics, techniques, and procedures (TTP) validated during Task Force XXI (TFXXI) and the Division XXI Advance Warfighter Experiment (DAWE) are also incorporated in this change. Included in these FXXI initiatives is the Raptor Intelligent Combat Outpost (ICO). Raptor ICO, an emerging system scheduled to be fielded in 2006, is included in this manual because of its potential to dramatically enhance the engineer forces ability to support FXXI operations, and the key role it will play in future operations. See: Engineer Digitial Systems (Appendix F).

The manual is fully compatible with the Army's operational doctrine as contained in FMs 100-5 and 100-7 and is consistent with current joint and multinational doctrine. This manual follows the format of FM 100-15 and supports the concepts and principals contained therein. It also compliments FMs 5-71-100 and FM 5-116.

The proponent of this publication is HQ TRADOC. Send comments and recommendations on Department of the Army (DA) Form 2028 directly to Commandant, US Army Engineer School (USAES) ATTN: ATSE-T-PD-PM, Fort Leonard Wood, Missouri 65473-6650.

NOTE: This manual does not address light infantry operations since much of the doctrine and TTP associated with the fielding and use of digital systems by these units have yet to be validated.

The Raptor Intelligent Combat Outpost (ICO) is an emerging system that is not scheduled for fielding until 2006. The system is included in this manual to support simulation exercises where the system and its capabilities are to be employed.

Unless this publication states otherwise, masculine nouns and pronouns do not refer exclusively to men.

CHAPTER 1

CORPS ENGINEER OPERATIONS

The objectives of the carpet-bombing effort in front of the VII Corps were to mask the assault and saturate enemy defensive sectors as far back as their direct-support artillery positions. Following the bombing, the 1st, 9th, and 30th Infantry divisions were to deliver a coordinated assault across a relatively narrow front and punch a hole through which the waiting 2nd and 3rd Armored divisions would launch a pursuit of the presumably routed German forces.

The 1106th Engineer Combat Group was moved up to the VII Corps' left flank to support directly the 30th Infantry Division and the initially trailing 2nd Armored Division as they advanced along high ground on the west bank of the Vire River. On the VII Corps right flank, the 1120th Engineer Combat Group would support the 4th and 9th Infantry divisions in the assault and the follow-on 3rd Armored Division in the pursuit. Our own 1111th Engineer Combat Group would act as the corps engineers in the VII Corps sector, devoting its efforts to opening and maintaining the supply routes and building and maintaining the longer, more permanent timber trestle bridges back along the MSR that would be opened by the advancing infantry and armor and initially cleared by the direct-support engineer combat battalions.

A description of Army breakout plans from the Normandy lodgment in July 1944. From the book, The First Across the Rhine, The Story of the 291st Engineer Combat Battalion, by Colonel David E. Pergrin with Eric Hammel.

The FXXI corps is a capability-based forced that provides joint or unified commanders with a force that is optimized for sustained land combat. Its tailorable organization makes it suitable to conduct distributed operations in all environments, across the full range of military actions. By its flexible design, the FXXI corps's capabilities reside with its subordinate units. The units provide the corps with a high level of lethality, survivability, and maneuverability against all enemy forces, including asymmetrical threats. The corps commander is an operational and/ or a maneuver commander.

All FXXI corps operations are joint and may be interagency or multinational. The corps's tailorable structure is an essential component in force-projection operations, especially when split-base operations are necessary. Improved connectivity to joint and potentially multinational forces enable the FXXI corps to bring the full weight of the joint or multinational team to bear at the appropriate time throughout the width, depth, and height of its area of operations (AO).

The FXXI corps conducts information operations (IO) to gain superior situational understanding and windows of information superiority that will facilitate the execution of decisive operations across all dimensions of the corps's AO. The FXXI corps executes force-projection operations to secure the joint task force (JTF) commander's theater strategic objectives in both mature and underdeveloped theaters.

THE ROLE OF CORPS ENGINEER FORCES

THE CORPS

The corps is the US Army unit capable of operating at both the tactical and operational levels of war. It is the instrument by which higher echelons of command conduct maneuvers at the operational level. Corps are tailored based on mission, enemy, terrain, troops and time available (METT-T) to contain all combat, combat support (CS), and combat service support (CSS) unit capabilities required to sustain operations for a considerable period. During force-projection operations, an Army corps may serve as the Army forces (ARFOR) headquarters to a theater command or JTF or as a JTF headquarters itself. The corps may control units from the Air Force, Navy, and Marine Corps, along with allied and coalition nations. A tailored corps engineer brigade is commonly available to the corps to weight its main effort and to perform special CS functions.

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THE CORPS ENGINEER BRIGADE

The corps engineer brigade commands and controls all engineer support to the corps and is assigned all engineer units that are not organic to divisions, separate maneuver brigades, and cavalry regiments. The brigade provides mobility, countermobility, survivability, and general engineering support to the corps based on METT-T. Corps topographic engineering support normally is provided by a topographic engineer company placed in direct support (DS) to the corps from the theater Army (TA) topographic engineer battalion. The corps engineer brigade augments engineers organic to divisions, separate maneuver brigades, and cavalry regiments.

The corps engineer brigade may contain various numbers of engineer groups, corps engineer battalions (mechanized, wheeled, airborne, and light), combat heavy engineer battalions, and separate engineer companies (fixed and assault float bridge, combat support equipment (CSE), light equipment (LE), and topographic). Other specialized engineer organizations will augment the corps engineer effort as the mission dictates. The brigade controls and staff supervises theater engineer forces from EAC operating in the corps area. These may include units such as prime-power battalions; construction support, pipeline construction, dump truck, and port construction companies; and utilities, well-drilling, firefighting, and other special teams and detachments.

The corps engineer brigade commander also serves as the corps engineer special staff officer. The corps staff engineer section (SES) assists him by providing engineer functional-area expertise to all corps staff elements. The SES provides recommendations to the corps staff on the use of engineer assets and ensures that the engineer battlefield functions are fully planned, integrated, synchronized, and executed to support the corps commander's intent and scheme of maneuver. The corps engineer also tasks and prioritizes the work effort of the DS corps topographic company.

In force-projection theaters where no forward-based theater engineer structure exists, the corps engineer brigade could initially function as the theater engineer headquarters and regional contingency engineering manager (RCEM). To do this, the brigade needs special augmentation from an engineer command (ENCOM) and/or the USACE in the areas of construction management, real estate acquisition, and construction contracting support. The brigade would execute this function until an ENCOM, TA engineer brigade, or engineer construction group arrives in theater.

In the absence of follow-on deployment of an ENCOM, TA engineer brigade, or engineer construction group, the corps engineer brigade (with the special augmentation listed above) may have to act as the theater engineer headquarters indefinitely.

SIMULTANEOUS OPERATIONS

Simultaneous deep, close, and rear corps operations comprise a special and continuous battle space synchronization requirement. The linkage between these operations assures that the aims, timing, and activities associated with these operations are mutually supporting. For commanders, synchronization of simultaneous operations will normally require deliberate planning and staff coordination. Simultaneous operations in depth have a direct impact on the enemy's cohesion. Corps units are no longer restricted to fighting three sequential operations (deep, close, and rear). Nor are in-depth operations conducted solely to establish favorable conditions for the close fight. The corps commander influences these operations by assigning on-order missions and priorities and allocating combat assets. He must describe, in his concept of the operation, how all deep, close, and rear operations will be executed simultaneously, their command relationships, and their relative priorities. The

corps commander will retain reserve forces under his control. The command echelon above corps designates the corps's AO. The corps geographically divides its AO into subareas where it will conduct close, deep, and rear operations. The use of lateral, rear, and forward boundaries is intended to better delineate responsibility and C2. However, combat operations in the corps area may be nonlinear, and the intermingling of opposing forces may be inevitable. The air and space above the corps's AO constitute a third dimension of the corps's battle space.

Corps engineers support operations throughout the corps's battle space based on the corps commander's intent and METT-T. Engineer support to all corps deep, close, and rear operations focuses on planning, coordination, synchronization, integration, and resource allocation. Successful engineer operations in support of corps operations require a thorough understanding of the terrain, threat capabilities, commander's intent, and scheme of maneuver.

Distributed Operations

Tactical operations conducted using digital systems enable the FXXI corps's major subordinate commands (MSCs) to operate over a much wider frontage. The expanded area that each MSC is capable of operating over extends the over-all FXXI corps's battle space and calls for both distributed and simultaneous operations. Distributed operations are an emerging concept. The synchronization of distributed operations will not differ appreciably from that of simultaneous operations. These operations will still require deliberate planning and staff coordination. However, with the advent of Army Battle Command Systems (ABCS) and other FXXI digital systems, the planning, coordination, and tactical decision-making process can be expedited. This is accomplished through the electronic vertical and horizontal sharing of intelligence data, situational awareness (SA) data, and planning data that are critical to the synchronization process. Due to increased digital enablers C2 and capabilities, the size of the corps's AO has increased exponentially.

Deep Operations

Deep operations allow the corps commander to engage the enemy throughout the depth of the enemy's AO so that the effects appear to the enemy commander as one fight. The corps conducts deep operations to destroy the enemy's cohesion, nullify his firepower, disrupt his C2, destroy his supplies, break his morale, or disrupt his introduction of follow-on forces. Firepower, both lethal and nonlethal, synergistically combines with maneuver in conducting deep operations.

The corps uses a Decide-Detect-Track-Deliver-Assess approach that enables the commander to take the initiative in selecting high-value targets (HVTs) before they actually present themselves in the target array.

The Decide phase provides the focus and priorities for the collection-management and fire-planning processes. During the Decide phase of deep operations, engineers provide terrain analysis that supports the identification of named areas of interest (NAIs) and target areas of interest (TAIs). Countermobility targets are recommended for nomination by corps staff engineers to the corps Assistant Chief of Staff, G2 (Intelligence) (G2)/Assistant Chief of Staff, G3 (Operations and Plans) (G3) deep operations coordination cell and the corps's joint targeting board. Recommended targets for nomination could include the emplacement of long-range scaterable mines (SCATMINEs) and the destruction of bridges and choke points. The use of deep countermobility emplacement systems, such as the Gator, needs to be planned and coordinated at least 72 hours before delivery time.

In the FXXI corps, the Hornet product-improvement program (PIP) and Volcano are added to the engineer family of munitions to provide force protection and support deep operations. When fielded, the Raptor ICO will give the commander additional capabilities through its intelligence-gathering, early-warning, and remote-triggering capability.

The Detect phase executes the decisions reached in the Decide phase. When target selection standards have been defined, a decision support template (DST) is prepared. The engineer supports the DST by providing special Digital Terrain Support System (DTSS) terrain graphics derived from the terrain team. These graphics are produced in paper copy and digital format for immediate dissemination over the Maneuver Control System (MCS).

The Track phase occurs when the target is out of range of corps fire-support systems or when future intentions need to be determined. Tracking is accomplished with various national, theater, and corps intelligence and surveillance systems. Information gathered using FXXI digital systems and the ABCS enables the corps engineer to identify likely locations for the emplacement of Raptor ICO air- or artillery-delivered mines.

The Deliver phase is executed rapidly by having designated fire-support systems respond to corps attack directives when the defined trigger events are detected by sensors.

During the Assess phase, a timely and accurate estimate of the damage resulting from the application of military force, either lethal or nonlethal, against the target is made. In the FXXI corps, the unmanned aerial vehicle (UAV) will compliment the process.

During the Decide, Detect, Track, Deliver, and Assess phases, corps engineers coordinate, integrate, track, and assess the effectiveness of all countermobility systems used in deep operations. Task-organized corps engineers support deep ground-maneuver mobility by participating in reconnaissance op-

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erations and by keeping open the ground routes, drop zones, landing zones, and other means of access needed by deep forces to sustain the fight.

Close Operations

Corps close operations include the simultaneous close, deep, and rear operations of committed divisions, separate maneuver brigades, and cavalry regiments. The outcome of corps close operations will ultimately determine the success or failure of the corps's battle.

The corps engineer brigade augments organic engineers in divisions, separate brigades, and cavalry regiments. Engineer groups, corps engineer battalions, combat heavy engineer battalions, engineer bridge companies, and engineer CSE and LE companies can be task-organized to support maneuver elements according to the corps commander's intent to weight the main effort. Corps engineers may also work in the division area on a task or area basis, such as constructing and repairing main supply routes (MSRs) from corps support group areas to the brigade rear boundary; constructing float and fixed bridging; emplacing corps-directed obstacles; constructing forward corps airfields and aviation support facilities; or providing survivability support for battle command nodes, field artillery, air defense artillery (ADA), and logistics support sites. All corps engineers operating in a division's area will be coordinated with the division staff engineer section (DSES). The division engineer and his staff control and supervise all engineer assets assigned and working for the division. In nonlinear environments where corps and division areas of responsibility may overlap, those corps engineer units working on corps projects within the divisions AO, will coordinate their efforts with the division engineer. The most common method of controlling and coordinating corps and division areas of responsibility remains a corps engineer work line (EWL). In FXXI operations, the EWL will change operations more than in AOE operations. Corps engineers also support separate corps brigades, such as artillery, aviation, air defense, military police (MP), military intelligence (MI), signal, and chemical brigades, in much the same manner. Major corps combined arms mobility operations, such as large-scale obstacle breaching and river crossings, are supported primarily by corps engineer units.

Topographic engineering support to corps close operations focuses on augmenting division terrain-analysis teams with data from other corps DTSS terrain teams. When division requirements exceed organic capabilities the corps headquarters staff section provides the priority for and providing topographic support. In preparation for close operations, topographic engineers support the corps G2 with weather and terrain analyses and terrain products that assist in the intelligence preparation of the battlefield (IPB) process. In addition, the DS topographic engineer company produces detailed, large-scale imagery products and other special products depicting areas where combat operations will be conducted. The topographic company survey team provides accurate geodetic survey control points for artillery, aviation, intelligence, and signal positioning.

With the advent of the DTSS, the topographic engineers are now able to acquire terrain products electronically through digital links with other national and strategic sources providing such data. This leads to a faster analysis of terrain and expedites the production of terrain products needed at all command levels to support the close fight. In addition, with DTSS, the topographic engineer is now able to create and maintain a storehouse of digital data (maps and imagery) that can be accessed via other ABCS systems. A new requirement imposed on the FXXI corps topographic engineer is acquiring and storing of digital maps for each of the ABCS platforms. This task is critical to combat operations in a digital environment.

Topographic engineers identify possible mobility corridors. Corps engineer battalions widen lanes through minefields and other obstacles breached by assaulting division engineers, breach obstacles that have been bypassed by assault forces, upgrade combat roads and trails, and keep open key routes designated by the corps G3 Corps engineer bridge companies provide assault float bridging and follow-on fixed bridging support. Corps engineer battalions, along with CSE and LE companies, repair battle-damaged roads and airfields. This repair includes forward aviation combat engineering (FACE) support such as constructing low-altitude parachute extraction (LAPES) zones and forward area rearm/refuel points (FARPs).

Countermobility support for corps close operations focuses on reinforcing terrain with obstacles that support the corps commander's intent and maneuver plan. Corps terrain analysts identify threat-sized regimental attack corridors. The corps obstacle plan degrades the enemy's ability to maneuver without hindering the maneuver of friendly divisions, separate brigades, and cavalry regiments. The corps commander will designate obstacle-restricted areas (ORAs), corps reserve forces' counterattack routes, any corps reserve demolition obstacles within the corps sector, and specific terrain

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features that must be protected for ongoing and future corps operations such as key MSR bridges. Corps engineer units augment the execution of the corps obstacle plan with division, separate brigade, and cavalry regiment engineers. Corps logistic planners anticipate and push Class IV/V obstacle packages (including mines and demolitions) forward to emplacing corps engineers as soon as mission requirements are known.

The improved air and ground sensors of the FXXI corps G2 and its MSCs are focused on locating and tracking the enemy to determine the enemy's dispositions, activities, and potential intentions early on. Once located, the Joint Surveillance and Target Attack Radar System (JSTARS), Comanche, and Longbow Apache (LBA) are used to provide a continues flow of near- or real-time information related to the enemy's direction of movement. Using this information, deep strike operations are planned and executed against the enemy's formations using long-range artillery (Crusader and Paladin) or attack helicopter assets (Apache, LBA, Comanche) well before the enemy reaches the main battle area (MBA). The corps and division engineers are instrumental to early deep strike planning. They assist the corps G3 by providing recommendations related to the employment of engineer systems and munitions such as Raptor ICO and the family of SCATMINEs.

Survivability support during corps close operations emphasizes the use of corps engineer battalions and attached engineer CSE and LE companies to protect critical corps communication nodes, command posts (CPs), logistics units, corps artillery, fire-direction centers, and ADA. Corps engineer units also construct protective berms and revetments for corps aviation units and nuclear, biological, chemical (NBC) collective protective shelters for critical corps units.

NOTE: For security and to avoid fratricide, corps engineer units not equipped with Force XXI battle command brigade and below (FBCB2) assets, when working with digitally equipped units, must establish standard procedures that help others to recognize their location. These procedures are required to alert all elements that friendly vehicles and troops are operating in the areas.

General engineering support to corps close operations concentrates on lines of communication (LOC) and MSR construction, maintenance, and rehabilitation in the corps's AO by corps engineer battalions and attached CSE and LE companies. Combat heavy engineer battalions may also be attached to the corps engineer brigade to perform vertical and horizontal construction missions. This includes the maintenance and repair of airfields for UAVs as well as Army aviation, Air Force, and Marine aircraft. Corps engineers will also develop logistics support areas (LSAs) that include terminal transfer points (TTPs), Class III fuel storage and transfer sites, Class V ammunition supply points (ASPs), enemy prisoner-of-war (EPW) camps, hospital sites, and troop bed-down facilities such as Force Provider.

Rear Operations

Corps rear operations are the activities conducted from the corps rear boundary to the rear boundaries of committed maneuver units. Rear operations are conducted to ensure the corps's freedom of maneuver and continuity of operations, including sustainment and C2. The corps must synchronize the rear operations' functions of terrain management, security, sustainment, and movement with their close and deep operations, in accord with the corps commander's concept and intent.

In support of terrain management, corps engineers conduct terrain analysis to assist in the positioning of corps reserve, CS, and CSS units. The corps engineer coordinates closely with the rear tactical operations center (RTOC) to identify rear security operations and engineer support requirements. Corps engineers with combat capability (wheeled, mechanized, airborne, or light) are

normally positioned in the rear area where they can control key terrain or improve the defensive capability of key bases and base clusters within the corps area. Corps engineers provide general engineering support to keep LOC open by building, maintaining, and repairing roads and airfields. Corps engineers also provide construction support for the corps support command (COSCOM) and corps aviation brigade facilities in rear areas. They coordinate with other theater engineer units and the host nation to keep railroads, waterways, and other transportation systems open and to provide necessary utility services in the corps area. Corps engineers plan and execute countermobility missions to block critical threat avenues of approach and to deny facilities in support of base and base-cluster self-defense plans. Rear survivability tasks include hardening C2 headquarters and digging in critical CSS facilities. Corps engineers assist in the preparation of area damage control (ADC) plans to facilitate the return of a base or base clusters to mission capability during or after hostile action or natural disasters. This is done by reducing the probability of damage, minimizing its effects, and aiding in the continuation or reestablishment of normal operations. Corps engineers provide mobility support for movement of MP and designated tactical combat forces (TCFs), including breaching and bridging support. Corps engineers with combat capability can also serve as a TCF with additional training augmented by indirect-fire support, heavy weapons, communications, and transportation equipment.

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CORPS BATTLEFIELD OPERATING SYSTEMS

Corps are the link between the operational and tactical levels of war. They plan and conduct major operations and battles. They create and maintain the conditions for the success of current battles and set up the conditions for the success of future battles. Operational planning concentrates on the design of campaigns and major operations. Tactical operations consist of conducting battles and engagements as parts of campaigns and major operations. The planning and execution of tactical-level battles are the corps' major roles. When conducting operations, the corps will synchronize and integrate operational- and tactical-level operating systems.

The corps engineer brigade is responsible for planning, coordinating, synchronizing, and integrating the five engineer battlefield functions of mobility, countermobility, survivability, general engineering, and topographic engineering into each operational- and tactical-level operating system.

Operational Intelligence

Operational intelligence is that intelligence which is required for planning and conducting major operations within a theater of operations (TO). At the operational level of war, the joint and multinational intelligence system concentrates on the collection and analysis of information that will lead to the identification, location, and analysis of the operational center of gravity and operational objectives. Operational intelligence also focuses on production efforts downward and concentrates efforts on fighting priority intelligence requirements (PIR) such as—

- Basic (or finished) intelligence.
- Strategic indications and warning.
- Tactical warning.
- Current intelligence reporting.
- IPB on an operational or theater basis.
- Targeting intelligence.
- Battle damage assessment and post-strike assessment.
- Collection requirements management (synchronization of intelligence product reports).

The corps engineer is critical to this process in the areas of collecting and processing operational information. He is the corps expert on threat breaching, bridging, and obstacle emplacement capabilities. He is responsible for advising the corps commander on the effective use of terrain. He coordinates with the corps G2/G3 for the collection of battlefield terrain information through reconnaissance and other collection sources such as satellite imagery. He coordinates with the theater engineer for corps topographic support requirements for surveying, terrain analysis, and reproduction. He assists in the distribution of terrain-analysis and other special topographic products and he defines the geometry of the battlefield by providing map products and geodetic surveys. The corps engineer evaluates the availability of standard and nonstandard maps and terrain-analysis data bases covering the corps's AO. If shortfalls exist, he and the corps G2 define specific requirements and coordinate the collection and creation of necessary data to build the corps topographic data base. The corps engineer prepares the topographic operations annex (Appendix A) for corps operations plans and orders. In coordination with the corps G2, he tasks and prioritizes the DS corps topographic company's work effort. The corps topographic company uses cartographic techniques to produce image- and map-based special-purpose products. These products include intelligence and operations overlays or overprints, modified combined obstacle overlays (MCOOs), image maps, expedient map revisions, line-of-sight (LOS) products, and precise survey and geodetic positions. The corps engineer also determines the need for a topographic survey to verify data used by military intelligence and fire-support systems. The corps engineer coor-

until heavier corps and theater engineer assets arrive.

Engineer Company (Combat Support Equipment)

The engineer CSE company is a deployable, equipment-intensive company that possesses significant earth-moving capability. It is normally attached to a corps engineer battalion (wheeled or mechanized) to augment the battalion's horizontal construction capability. It can also operate independently while under the direct control of the combat engineer group. The primary roles for an engineer CSE company are —

- Survivability and tank ditching during deliberate defensive operations in forward brigade areas.
- Horizontal general engineering along MSRs and combat trails in other corps' close-operation areas.
- Horizontal general engineering and survivability in corps' rear areas.

Engineer Company (Topographic)

A topographic engineer company from the theater topographic battalion is placed in DS of the corps.

NOTE: In the FXXI corps, a separate engineer company (topographic) is organic to the corps engineer brigade. This company provides the corps engineer the same topographic support as provided by the DS company from the theater topographic battalion.

Capabilities of the company include the full spectrum of topographic support, as in the battalion, with personnel and equipment to provide products for the corps's AOs. Depending on the distance from the battalion and the tactical situation, the topographic company may be attached to the corps for administration and nontopographic logistics support. The theater topographic battalion provides topographic supply and intermediate maintenance for topographic equipment. A terrain-analysis element of the company is placed in DS of the corps G3/G2, and another terrain element remains in GS of other customers such as the G4, engineer, and signal. The terrain-analysis element furnishes rapid-response and special-purpose topographic support to the corps staff for operations planning and IPB. The production assets remain available to all in a central location. The surveyors are normally operating throughout the corps area extending geodetic control. Other elements of the company may be task-organized and placed in support of a supported division or task force for a limited time and for a particular tactical operation. Requirements that cannot be met by the company because of priority workload or complexity are passed to the topographic battalion for completion. Normally, the corps topographic engineer company is centrally located in the corps rear area.

Engineer Company (Ribbon Bridge)

The engineer ribbon bridge company employs a dependable, versatile float-bridge system which can be rapidly emplaced in a close combat environment. The ribbon bridge company is normally task-organized with a corps engineer battalion or combat engineer group as part of river-crossing operations. The ribbon bridge components can be transported by specialized bridge trucks or sling-loaded by medium-lift helicopters to the bridging site. The engineer ribbon bridge company has a secondary mission of providing logistics haul capability using its bridge transport trucks when the bridge is down loaded.

Engineer Company (Panel Bridge) and Engineer Company (Medium Girder Bridge)

These engineer fixed-bridge companies are capable of rapidly emplacing tactical standard bridging, either panel bridges (normally Bailey bridges) or medium girder bridges (MGBs), over wet or dry gaps in a close combat environment. These fixed bridges can be used to replace assault float bridges or to bridge gaps that exceed the capabilities of the armored vehicle launched bridge (AVLB).

Normally, these engineer fixed-bridge companies are task-organized to a corps engineer battalion or combat engineer group to support gap-crossing operations. These companies also have a secondary mission of providing logistics haul capability using its organic trucks when the bridge is down loaded.

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Engineer Company (Multirole Bridge)

An assault float bridge and an MGB element comprise the multirole bridge company. This 184-man company consists of a company headquarters (HQ), one assault float bridge platoon, one assault bridge platoon, one multirole bridge platoon, and a support platoon. This company provides the FXXI corps an added gap-crossings capability. However, the bridging resources of the multirole bridge company are limited and will require corps augmentation to perform multiple bridging missions.

Engineer Team (Diving, Light)

The engineer diving team (light) is capable of supporting the corps commanders' diving requirements on the battlefield. The team focuses on offensive, defensive, retrograde, river-crossing, deception, and ADC operations. It is capable of underwater construction, underwater reconnaissance, underwater obstacle emplacement and reduction, and river-crossing support, all of which require mobile equipment. It is also capable of supporting diving requirements in ports, harbors, and coastal zones. However, it lacks the heavy equipment required to support major port construction projects, decompression dives, and salvage operations. The team can provide its capabilities in support of OOTW.

CORPS ENGINEER SUPPORT TO DIVISIONS, SEPARATE BRIGADES, AND CAVALRY REGIMENTS

The corps engineer brigade augments engineer units organic to divisions, separate brigades, and cavalry regiments based on METT-T. These organic engineer units are focused on close combat mobility, countermobility, and survivability support to maneuver forces. Corps engineers provide additional support in these functions along with general and topographic engineering support. Engineer organizations and special staffs organic to divisions, separate brigades, and cavalry regiments that can be reinforced and augmented by the corps engineer brigade follow:

Division
- Staff Engineer Section (Heavy)
- Engineer Battalion (Heavy)
- Engineer Battalion (Airborne)
- Engineer Battalion (Air Assault)

Separate Maneuver Brigade
- Engineer Company

Cavalry Regiment
- Engineer Company

Headquarters, Engineer Brigade (Heavy)

The armored or mechanized division has an organic engineer brigade with a headquarters and headquarters detachment (HHD) and mechanized division engineer battalions. They normally train and operate with each maneuver brigade in the division, forming habitual support relationships. The armored or mechanized division engineer brigade commander also serves as the division engineer special staff officer. The armored or mechanized division headquarters provides centralized C2 and planning for the total division engineer effort. It recommends the task organization for division engineer battalions and reinforcing corps engineer battalions and separate engineer companies to the division commander or G3 based on METT-T. The armored or mechanized division engineer brigade commander may detach companies from one division engineer battalion to another battalion (main effort) or to another maneuver unit such as the division cavalry squadron. Mechanized corps engineer battalions and CSE companies normally are task-organized to the armored or mechanized division. The armored or mechanized division engineer provides coordination for corps engineer assets working in the division AO on a task or mission basis.

A division engineer and his special engineer staff (DSES) support the FXXI division. As previously discussed, the DSES coordinates the work of all divisional and nondivisional engineer units operating within the division's AO. The DSES will normally manage a —

- Corps engineer group with its battalions, companies, and teams.
- Terrain detachment (DTSS-equipped).

The DSES coordinates and exercises control of engineer units operating in the division AO for the division commander. In this capacity, it —

- Performs engineer mission planning and plans integration and mission synchronization.
- Provides recommendation to the division commander related to the employment of engineer units, systems, and equipment.
- Recommends organic and attached engineer task organizations to the G3 to accomplish general-engineering, mobility, countermobility, and survivability missions.

Engineer Battalion (Heavy)

Each maneuver brigade of a FXXI division is assigned an organic engineer battalion. This battalion normally trains with the brigade combat team (BCT) to hone and refine TTP associated with engineer support of combined arms operations at the brigade and battalion/task force (bn/TF) levels. The engineer battalion commander provides the brigade commander with the operational interface required to manage the operations of all organic and attached engineer assets operating within the brigade's AO or in support of brigade/battalion operations. These operations may include—

- Mobility, countermobility, and survivability operations.
- River-crossing operations.
- Reconnaissance operations.
- Topographic support.

Engineer Battalion (Light)

The light infantry division has an organic light engineer battalion with an HHC and three light division engineer companies. These companies establish and maintain a habitual-support relationship with each light infantry brigade in the division. The light division engineer battalion commander also serves as the division engineer special staff officer. He focuses on supporting the light division fight by recommending the task organization of elements of the battalion assault and obstacle (A&O) platoon, light combat engineer platoons, and corps' assets to the division commander or G3. The task organization of light division engineers depends on METT-T and requires extreme flexibility. Light division engineers must be concentrated at the main effort location, at the critical time, under centralized control. Austere light engineer companies re-

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CHAPTER 2
COMMAND AND CONTROL

(General) Walker knew very well that these forces could not stop a major CCF offensive. His purpose in deploying the 2d Division northeasterly was to give the ROKs moral support and prevent a disastrous ROK bugout. Meanwhile, he continued drawing plans for a deep withdrawal to a line at the Kum River.

On December 22 (1950) Walker called the engineer Pat Strong to Eighth Army's tactical CP in Seoul. He gave Strong orders to prepare for a "scorched earth" policy. He would blow up "every bridge and culvert" on the railways and highways, "every foot of railroad line," and a huge "tidal lock" at Inchon. Strong was aghast. He viewed these orders as utterly defeatist, "the scorched earth policy of an army that would never return." He did not have sufficient resources to rebuild these structures should Eighth Army regain the offensive. For that reason he "pleaded" with Walker to restrict demolition to "key bridges" and merely a single span in other bridges and, since the U.S. Navy controlled the seas and would deny the CCF use of Inchon, to spare the tidal lock, which would take "months" to rebuild. But Walker refused to change the order...

A description of the withdrawal from the Yalu River, from the book, The Forgotten War, America in Korea 1950-1953, by Clay Blair.

Corps engineer C2 is the exercise of leadership through a system of organizations, facilities, and processes that plans, directs, controls, and coordinates corps engineer operations. Effective corps engineer C2 is crucial to providing the corps commander with responsive engineer support throughout the corps's AO. It enables the corps engineer brigade commander to integrate engineer plans into future operations as well as to synchronize the effort involved in the current fight. This chapter focuses on establishing effective engineer C2 with the corps. It draws on the C2 principles and structure outlined in FMs 101-5 and 100-15.

THE CORPS ENGINEER BRIGADE COMMANDER AND HIS STAFF

COMMAND

Corps battles are the key to tactical and operational campaign success. Personal leadership is the most vital component of combat power and has the most critical impact upon the outcome of battles and campaigns. FM 101-5 describes the essential concepts of command—authority and responsibility. Commanders can delegate authority to subordinate commanders; however, they retain responsibility at all times. Command is personal, and a commander must take his role seriously. Battle command has two vital components: decision making and leadership. Commanders command one level down and monitor two levels down.

The corps engineer brigade commander provides the purpose, direction, and motivation for his soldiers to accomplish the difficult and dangerous engineer tasks that support corps operations. The brigade commander determines what his leadership team and subordinate engineer organizations need to be able to do in war, establishes or reinforces standards, and then resources and trains the corps engineer forces.

The corps engineer's role as both a brigade commander and corps special staff officer provides unique leadership challenges. The brigade commander positions himself where he can best command engineer support for the corps commander. In his role as commander, he is at the scene of the engineer main effort. He promotes command presence that enhances the morale of corps engineer forces. The brigade commander is also the corps commander's engineer special staff officer, directly accessible to the corps decision makers. He assists the corps commander by controlling the total engineer fight, anticipating problems, providing timely recommendations, and participating in initial future planning. He must balance his time commanding and controlling subordinate corps engineer units with his time needed to be with corps decision makers.

CONTROL

FM 100-5 states that commanders use control to regulate forces and functions on the battlefield in order to execute the commander's intent. A commander derives the authority to control another unit from his command responsibility. A supported unit commander, such as the maneuver division commander, has the authority to coordinate directly with supporting commanders in order to synchronize his plan and adjust its execution. The supporting commander must accomplish these tasks for the supported commander and is responsible for the internal control of his unit. Unit task organization, with designated command and support relationships, prescribes the supporting commander's authority over other commanders. Commanders can use forms of procedural controls for indirect purposes to accomplish clear, easily understood tasks. These include maneuver graphics, concepts of operation, mission orders, regulations, doctrine, and standing operating procedures (SOPs) to control subordinate units' actions. Positive controls are used for direct purposes to accomplish complex or vague tasks. These include setting times for mission accomplishment, committing reserves, and implementing changes to plans.

NOTES:
1. The corps engineer brigade commander in the FXXI corps uses the video teleconference (VTC) white-board and digital overlays to communicate orders and control subordinate units actions. The constant exchange of information via these digital systems will facilitate mission rehearsal, clarify mission understanding, and confirm mission taskings and role play.
2. The corps engineer brigade commander will use a mix of digital and voice systems for C2 of on going engineer activities. The Maneuver Control System Engineer (MCS-ENG), All-source Analysis System-Remote Workstation (ASAS-RWS), Combat Service Support Control System (CSSCS), and DTSS are used to exchange intelligence, logistics, topographic data, and to maintain SA.

In advance of events, the corps commander establishes the conditions he wants to obtain at the conclusion of the battle or campaign. His concept of the operation includes his intent, his vision of the end conditions, why those end conditions are necessary, and how the corps will achieve those results. This concept of the corps operation provides the focus for all corps engineer operations and extends the corps commander's intent throughout the entire engineer force. All corps engineer leaders maximize decentralization of engineer support to the corps. They issue engineer orders that clearly indicate what must be done, but provide subordinates with maximum latitude as to how to get it done. They promote bold, innovative, risk taking and the immediate use of opportunities within the context of the corps engineer brigade and corps commander's intent.

The corps engineer brigade commander develops his engineer concept of the operation that provides the basis for engineer task organization, scheme of engineer support, tasks to subordinate engineer units, engineer work areas, synchronization, and identification of critical collateral engineer operations. Success in the execution of the engineer concept requires the brigade commander's personal attention and perseverance, his ability to recognize the need for changes or modifications to the engineer concept, and his ability to affect the necessary changes in a timely manner. He formulates a new engineer concept or revises it whenever there is a changing corps mission or situation.

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He continuously analyzes his engineer mission and maintains a continuous engineer estimate and engineer battlefield assessment (EBA), modifying his engineer concept over time as the need arises. The corps engineer visualizes the large and complex operation of his own engineer force and corps maneuver and logistics forces (as well as that of the enemy) and projects that visualization into the future. The engineer concept is sufficiently detailed so that the staff can develop the plan and specific engineer missions for subordinate engineer units so that they can take actions to support the plan, even in the absence of subsequent guidance. Several iterations may be required to clearly refine the engineer concept.

An engineer control process achieves agility by overcoming the inherent perception of engineers being "tied to the terrain." To enhance this agility, the engineer brigade commander controls subordinate engineer forces from any location on the battlefield. He provides a responsive control structure by organizing the corps engineer brigade staff, establishing engineer control facilities, and defining the engineer control process used. He effectively uses his engineer control organizations to hear, see, and understand all engineer battlefield missions within the corps. The corps engineer control system provides timely and accurate information through the use of periodic engineer situation reports (SITREPs) and other engineer battle information systems that monitor corps engineer support to the battlefield. Face-to-face discussions between the corps engineer and subordinate engineer commanders often tell much about the engineer situation. The corps engineer control system rapidly transforms the engineer brigade commander's decisions into specific directions through the corps operation order (OPORD) and engineer annex to engineer units augmenting divisions, separate brigades, and the cavalry regiment, as well as through corps engineer brigade orders to engineer units under engineer brigade control.

The corps engineer brigade commander and his staff understand the terrain and their opponent well. They know the available strategic and operational imagery products and topographic systems that provide the necessary terrain information to corps planners. The brigade commander and his staff provide recommendations to the corps commander on how to defeat various threat engineer capabilities such as bridging, breaching, and obstacle-emplacement systems.

The corps engineer brigade commander and his staff understand and are proactive with corps logistics operations. Continuous engineer input with corps logistics planners ensures that corps engineer forces are properly supported and sustained throughout campaigns and battles. In addition, extensive survivability or general engineering support to corps logistics forces is also planned and executed in a timely manner.

A well-trained, smoothly-functioning corps engineer brigade staff requires that the brigade commander develop, train, guide, and demand high standards of performance from all members of the staff in peacetime to ensure that they are properly prepared for war. This demands realistic, difficult training exercises in support of the corps, with all key engineer players present and performing their engineer functions as they would in battle. The ability to synchronize thought with the corps engineer brigade commander is more than just understanding the commander's intent. It is that single unity of thought developed through interaction with the brigade commander so that the engineer staff thoroughly understands his thought processes and how he would react in any given situation.

CORPS ENGINEER COMMAND AND CONTROL ORGANIZATION

The corps commander exercises control through the ABCS from several CPs and a command group. ABCS is the battle-command system used by all tactical echelons up through the corps (see Figure 2-1 for the ABCS). The corps also provides the link between ABCS and the battle-command systems of the joint or multinational C2 systems that are a part of the Army Information Systems Network (see Figure 2-2). The distillation, management, and dissemination of information produced through this linked network of automated computer systems are critical functions of battle command. Battle command, while an art, relies on the ability to process information, tailor it to fit special needs or levels of command interest, and move it rapidly to those who need the information the most. ABCS enhances this distillation, management, and dissemination process.

CPs support the corps commander by providing the structural framework to facilitate planning, directing, controlling, and coordinating the corps's operations. A separate entity called the corps command group is also formed and has specific functions and characteristics. Figure 2-3, page 2-6, graphically depicts corps and engineer CP locations.

The corps engineer brigade normally establishes a separate brigade CP under the control of the deputy brigade commander (DBC). In addition to establishing the brigade CP, corps engineer planning-and-control capability is available at each corps CP (assault, tactical, main, and rear) and is available to the corps command group as

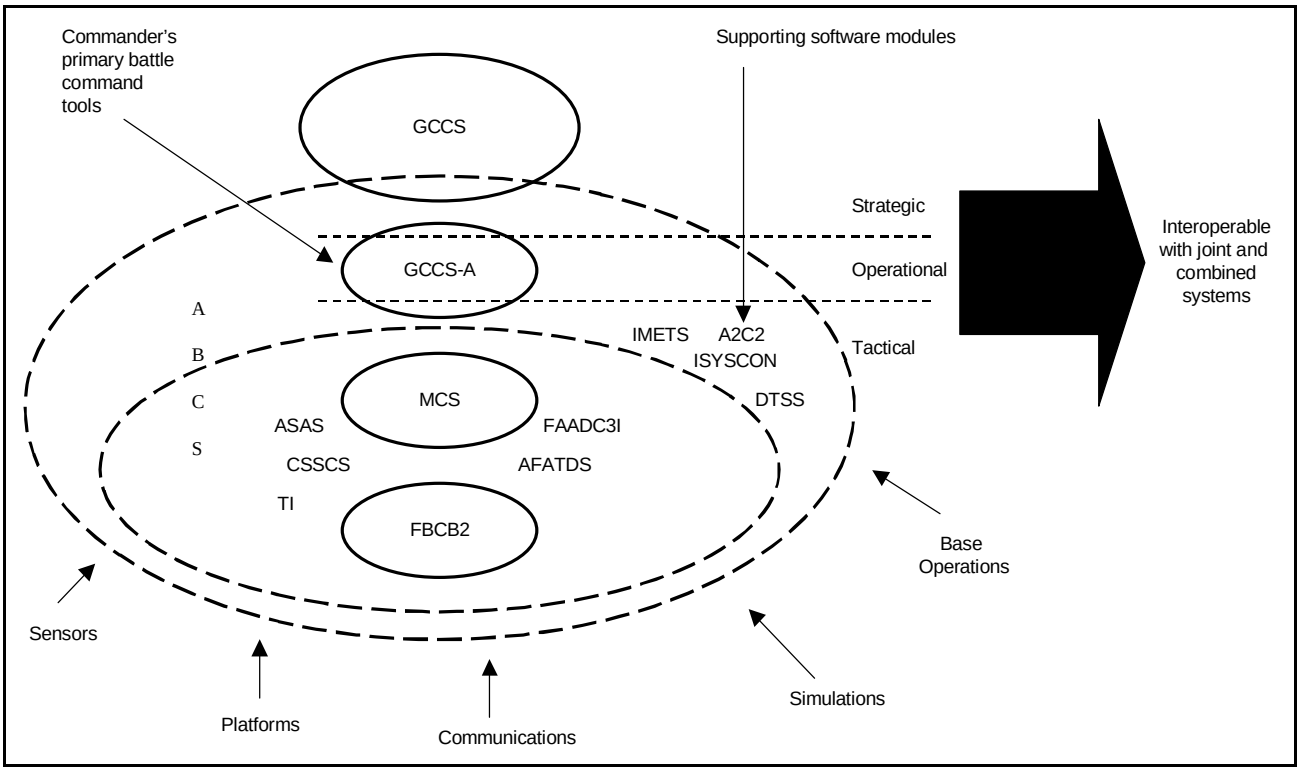

Figure 2-1. Army Battle-Command System (ABCS) architecture

Fragmentary Order

The FRAGO allows the corps engineer brigade commander to modify the current OPLAN or OPORD quickly, based on changes in the situation. The FRAGO only outlines changes; all other instructions in the base OPLAN or OPORD remain in effect. A FRAGO has no set format or content; it is modified to meet the needs of the situation. The FRAGO can be used to change any part of the base OPLAN or OPORD. Normally, the corps engineer brigade commander uses the FRAGO when there is an immediate tactical requirement to adjust engineer task organization or the scheme of engineer operations, or to submit missions. With few exceptions, task-organized corps engineer units do not execute the FRAGO until coordination has occurred with the supported commander. Appendix A provides a sample format for a FRAGO.

CORPS ENGINEER INFORMATION REQUIREMENTS

Corps engineer commanders must receive timely and accurate battlefield information in order to affect future engineer support plans. Several means of gathering this necessary information is used by engineer commanders. They include personal reconnaissance, visits with subordinate engineer units, periodic staff briefings and updates, and periodic reports transmitted through the corps signal system or delivered by courier. All of these means, provide information to the commander so that he can decide whether to continue with the current engineer support plan, change to a branch plan, or drop the current plan completely and make a new one. To allow the corps engineer commanders to be at critical points on the battlefield to gather information, it is imperative that adequate transportation and communications capability be available to them.

Using the ABCS and other FXXI systems, corps commanders and their engineer commanders are now able to receive and exchange timely and accurate battle-space information. This digital capability fills information voids related to terrain or enemy activity that previously took hours or days to fill. In addition, the use of the VTC and white board enable face-to-face coordination and information exchanges while negating the need to conduct time-consuming visits with subordinate engineer units. However, the digital enhancements do not entirely eliminate the need to conduct periodic unit visits.

Personal Reconnaissance

The best information corps engineer commanders can receive is what they can actually see and hear through personal reconnaissance of ongoing engineer support missions. By observing engineer operations, commanders can immediately assess the cause and effect of corps engineer support plans. A danger lies in relying totally upon personal reconnaissance for decision making, as it is just a snapshot in time and space, not showing the overall dynamics involved in the corps fight.

Visits With Subordinate Units

Through discussions with subordinate units, corps engineer commanders gather fairly timely and accurate engineer operational and logistical information. This is especially critical with corps engineer units that are task-organized to divisions, separate brigades, and the cavalry regiment.

Periodic Staff Briefings and Updates

Corps engineer commanders continually receive briefings from higher headquarters staffs and their own engineer staff concerning threat, maneuver, engineer, and logistical support information. This information is normally not as timely as personal reconnaissance or visits with subordinate engineer units, but it provides a broader perspective of corp's engineer support to the battlefield. However with the FXXI units, timely information can now be obtained with a prospective on the situation approaching that obtained during personal visits. The use of FXXI tools and procedures synchronizes

understanding at all levels of command and facilitates update of the commander's information. These tools and procedures include such things as conducting VTC updates that use the white board for drawings and continuous referral to digital overlay in conjunction with SA icon displays shown on the command information center's large computer displays. As a result, these techniques eliminate much of the time previously lost to travel in accomplishing personal visits to distant commanders' locations. Once the information is obtained, no matter what the source, all available staff information is compiled and consolidated to proved a broader perspective of corps engineer support to the battlefield.

The briefing forum provides a setting for the corps engineer commander to explain his intent and concept of engineer support to the corps. Any changes to the current plan are explained in detail. Decisions are often made during these briefings by the commander, so it is critical that key engineer staff and subordinate engineer unit commanders be present.

Transmitted Reports

Periodic reports transmitted through the corps signal system or by courier provide critical information to both the brigade commander and his staff. Standard reporting formats of key engineer information requirements help determine trends in engineer support, allowing the brigade commander to make decisions based on

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higher quality information (see Appendix C for a template of standard corps engineer report formats). Corps engineer force information that is transmitted to the corps engineer brigade headquarters and SESs can be described in four general types: engineer operations and intelligence information, engineer logistics and personnel information, corps operations and intelligence information, and corps logistics and personnel information.

Engineer operations and intelligence information flow. Figure 2-11 shows engineer operations and intelligence information flow. This information includes such things as DA Form 1355 minefield reports, intelligence spot reports (SPOTREPs), engineer situation reports (ENSITREPs), NBC reports, and so on. Two paths are used by corps engineer forces assigned to the corps engineer brigade and task-organized corps engineer forces supporting divisions, separate brigades, and the cavalry regiment. The paths work both ways, with the majority of information flowing from corps engineer units to the brigade CP and corps SES. The managers of this information

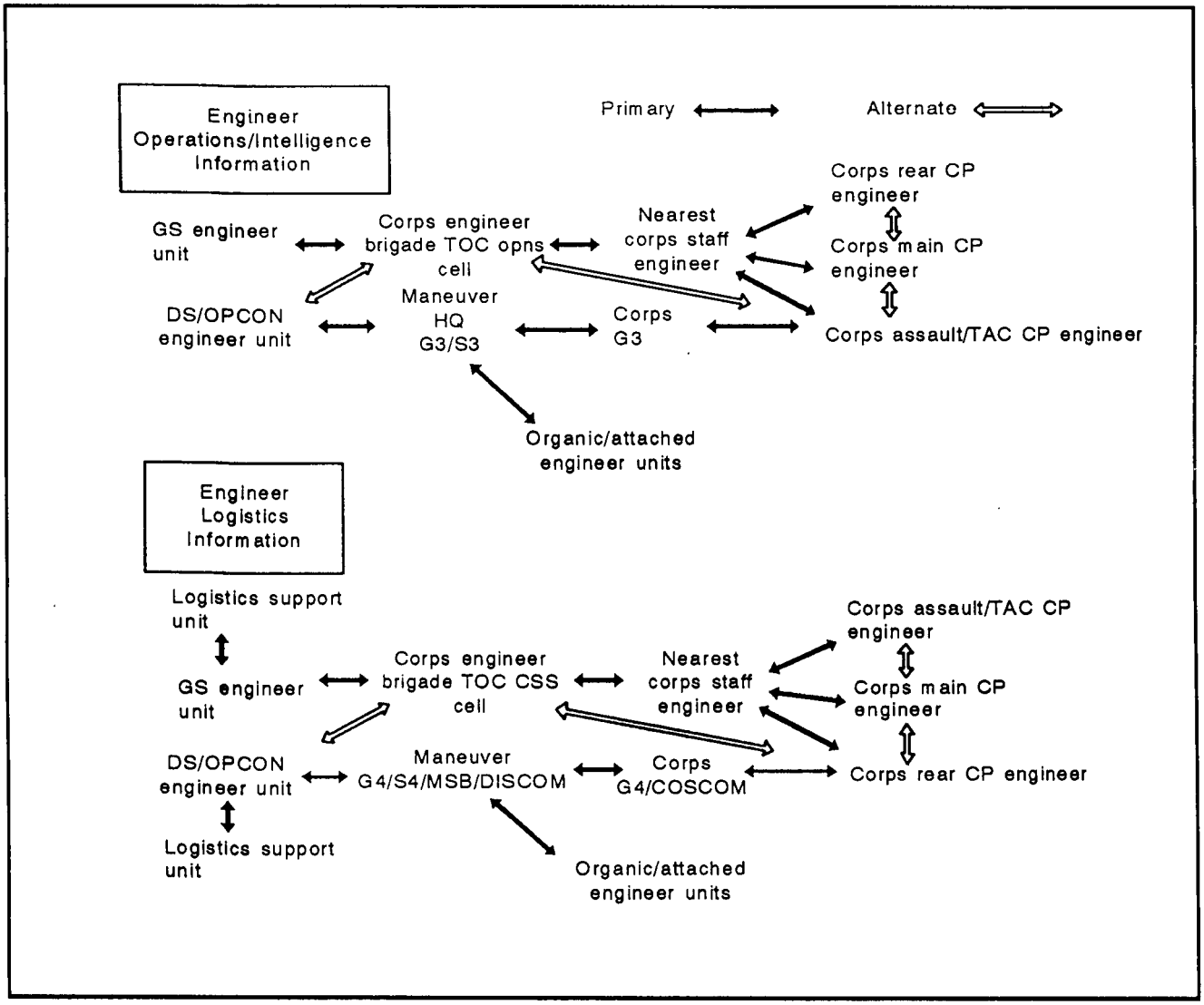

Figure 2-11. Corps engineer information flow

CHAPTER 3
FORCE PROJECTION

The (7th Engineer) Brigade units occupied various locations in tactical assembly area (TAA) JUNO in advance of VII Corps. We immediately began sustainment operations which provided life support and protection for arriving units. These missions included constructing unit-sized protective berms, airfields, helipads, hospitals, roads, ammunition storage areas, and a petroleum storage area and applying dust palliative. The Brigade also executed projects in support of the corps train up for offensive operations. Several tank gunnery ranges were built in division areas and the 176th Engineer Group constructed a replica of the Iraqi barrier system to rehearse combined arms breaching operations. The engineers participated in this breach training as an integral part of the team, which culminated in a live-fire exercise using the mine-clearing line charge (MICLIC).

From the 7th Engineer Brigade Command Report--Operations desert Shield and Desert Storm, dated 9 April 1991, Colonel Samuel C. Raines, Commanding.

Force-projection operations usually begin as a contingency operation in response to a crisis involving imminent or actual military involvement during war or OOTW on a regional scale. These crises present a definite threat to US interests, but the situation, military mission, and military threat are often vague and uncertain. The objective area may be defended or it may be benign; the threat may be mobile and armored or it may be a light paramilitary force; the terrain could be steep jungles, wide open deserts, or high mountain valleys.

The corps will conduct force-projection operations as part of a joint and possibly multinational force under the OPCOM of a Commander in Chief (CINC) or joint force commander. The corps's mission could range from a simple show of force to providing a deterrent force against a major and immediate threat. The ability to project continental United States (CONUS)-based, ground combat power is critical as forward-presence US forces have declined over the years. Adherence to Army-operations tenets requires close cooperation with US Naval, Marine, and Air Forces. In addition, operations in foreign territory will require multinational efforts with host-nation and coalition military forces. Engineer support efforts require close coordination and cooperation with joint and coalition military engineer forces along with host-nation support agencies to meet force-projection mission requirements.

Digital systems have supported and will continue to support worldwide force-projection operations such as Just Cause, Desert Storm, and Bosnia. With their improved command, control, communications, computers, and intelligence (C4I) and weapons systems platforms, the FXXI corps and its divisions are ideally suited to respond to worldwide crisis. The digital capabilities of the FXXI corps,

when coupled with its improved weapon systems, make it highly lethal. With the fielding of new engineer mobility platforms and munitions, the corps engineer further improves that lethality. For example, engineer mobility systems such as Wolverine and Grizzly can enhance the corps's ability to maintain the commander's desired operational tempo during support of wartime mobility operations. Conversely, intelligent minefield systems, such as the Raptor ICO, can be employed in a countermobility or economy-of-force role.

The corps engineer, with systems such as the DTSS, support predeployment operations by filling critical intelligence voids related to terrain and their impact on contingency or OOTW. With the DTSS and its links to other national and strategic sources, the corps terrain team can acquire and archive up-to-date map datum and geospactial imagery that support predeployment contingency mission planning. Once deployed, the DTSS supports extended operations through updates of the terrain databases. These updates are drawn from national and strategic sources as well as the corps and division engineer units using systems such as the Land Warrior/Digital Reconnaissance System (DRS), the Long Range Acquisition Scout Sensor Suite ($LRAS^3$) and the UAV detection. In addition, the Raptor ICO sensor can be employed along with the G2 systems, such as the Improved Remotely Monitored Battlefield Sensor System (IREMBASS), to gather intelligence related to a threat's movement within the contingency AO.

All of the ABCS and FXXI systems are used to share critical real- or near real-time information that facilitates the maintenance of a high state of SA and a relevant common picture (RCP). These systems, when properly leveraged, will enhance predeployment, deployment, and postdeployment planning and operations as well as achieving information dominance.

FORCE-PROJECTION CONSIDERATIONS

FM 100-5 describes several key considerations that apply to force-projections operations. The following describes engineer capabilities that should also be considered.

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LETHALITY FOR THE DEPLOYING FORCE

In all contingencies, the early-entry force must possess the required lethality to accomplish the mission and protect the force the moment it arrives in theater. Corps engineers contribute to the lethality of the early-entry combat force through placing minefields and other obstacles, along with protecting the lodgment by constructing secure C2 nodes, logistics bases, and other needed fortifications and survivability positions. Corps engineer mobility, such as bridging, gap crossing, and obstacle breaching, enhances the lethality of combat forces securing operational objectives.

ANTICIPATION AND INTELLIGENCE

Force-projection anticipation is the expectation of being alerted and deployed. The rapid introduction of US forces requires accurate, detailed, continuous, and timely intelligence. Corps engineers anticipate and provide needed topographic terrain products of likely contingency areas in support of the ongoing IPB process. They assess available infrastructure for possible general engineering requirements, including airfields, MSRs, ports, utilities, and logistics facilities. They determine threat engineer capabilities in likely lodgment areas, including requirements for countermine and counterobstacle capabilities needed with the early-entry force. They also consider planning and support which may be available through the logistics civil augmentation program (LOGCAP) and USACE contracting capabilities.

FORCE TAILORING AND TEAMWORK

Force tailoring is the process of determining the right mix and sequence of units. Proper planning should give the operational commander the resources and dispositions to deal with any eventuality that might jeopardize either mission accomplishment or force protection. Commanders consider the factors of METT-T, strategic lift, pre-positioned assets, and host-nation support when they tailor forces. Deploying units must be extremely flexible and versatile, placing a premium on early and continuous teamwork. Corps construction engineers may be the initial forces deployed during unopposed entry operations where limited host-nation support and infrastructure exist. Other corps combat engineer forces may flow with and closely support early-entry combat forces.

JOINT BATTLE COMMAND

Because of the joint and possibly multinational nature of force-projection operations, commanders must establish a battle-command system that can contend with the simultaneous challenges of deployment, entry, and combat while retaining the capability to adjust to the evolving conditions of each. Corps engineers are involved in each of these challenges--supporting deployments while also deploying themselves, supporting lodgments with construction, and supporting maneuver operations with combat engineering. This requires corps engineers to execute missions at the small-unit level while joint engineer battle-command echelons are separated in time and space.

A key battle-command consideration is the method in which joint and multinational engineer forces, including USACE civilian contractors, are commanded. When the corps is designated as a JTF or multinational headquarters, the engineer staff should be placed under the Operations Directorate (J3) staff or as a separate joint or multinational SES. When the corps serves as an ARFOR headquarters, the use of a standard corps SES (as described in Chapter 2) applies. Engineers should avoid being placed under the auspices of the joint or multinational Logistics Directorate (J4) staff. Lessons learned from force-projection operations show that when staff engineers are placed under the J4, engineers are prioritized to support logistics forces in theater at the expense of maneuver and other deployed units. In addition to ensuring proper engineer staffing at the JTF or ARFOR level, a separate engineer headquarters (such as the corps engineer brigade, an ENCOM, a TA engineer brigade, or an engineer group) should be identified to command and control the varied,

CHAPTER 4
LOGISTICS

Another substantial undertaking was the construction and maintenance of several MSRs to support the movement of soldiers, equipment, fuel, food, water, and ammunition. These MSRs were color coded Green, Blue, Black, and Gold. Over 68 miles of new MSRs were constructed, with maintenance required on over 204 miles. Operations were conducted around the clock with all of the company's assets. Continuous sustainment operations reduced the average life span of grader cutting edges to three days. Heavy dust one day and heavy rains the next provided added challenges every day.

From the 131st Engineer CSE Company Unit History in Support of Operation Desert Shield/Storm, dated 10 March 1991, Christopher D. Bishop, Commanding.

Logistics is the process of planning and executing force sustainment in support of military operations. A force-projection Army depends on the right logistical decisions prior to the onset of operations. There is normally little time for last-minute logistics fixes when the decision to employ combat forces has been made.

Corps engineer force sustainment is critical for maintaining and multiplying combat power. Logistical operations sustaining corps engineer activities accurately anticipate engineer needs. Many corps engineer logistical needs are unique, one-of-a-kind requirements that demand improvisation by the logistician and oftentimes strain the logistical system. Special engineer equipment is of low density, requiring intensive management to ensure availability for mission use. Engineer mission materials are normally bulky, heavy, and hard to transport. They must be requisitioned, transported, stockpiled, and issued in a streamlined manner. Engineers play a key role in supporting corps logistics operations, including the construction, upgrade, and maintenance of logistics bases, troop bed-down facilities, airfields, ports, and MSRs.

This chapter focuses on the sustainment of corps engineer units and corps engineer support to corps logistical operations. It supplements doctrine found in FMs 100-10 and 63-3.

THE UNDERPINNINGS OF LOGISTICS

The objective of logistics is to ensure operations succeed and facilitate the commander's ability to generate and mass combat power at the decisive time and place. Logistics is a major operating system. Strategic and operational logistics support wars, campaigns, and major operations; tactical logistics support battles and engagements. Corps logistics focuses on

operational and tactical support. Corps engineers closely support operational logistics in areas such as renovating existing facilities or, if required, constructing new troop bed-down facilities for force-reception operations; opening ports and airfields to develop the theater infrastructure; and assisting in the distribution and management of material, movements, and personnel and health services by constructing and maintaining MSRs and other logistics support facilities. Operational logistics support encompasses those activities required to sustain campaigns and major operations and to enable success at the tactical level of war.

Tactical logistics encompasses all CSS and engineer activities required to sustain the tactical commander's ability to fight battles and engagements. Successful tactical logistics provides the right support at the right time and place to units in the combat zone. Corps engineers receive tactical logistics support from COSCOM units in the areas of manning, arming, fueling, fixing, moving, and sustaining. Corps engineers support tactical logistics operations in areas such as constructing FARPs, digging in ASPs and corps logistics C2 nodes, and erecting fixed bridging along forward supply routes.

Regardless of the war level, the corps engineer logistical support structure and resource requirements are dependent upon METT-T. The corps engineer logistical support structure fully supports the corps commander's intent and is integrated into his concept of operation. Trade-offs between combat and general engineering capabilities in the corps area directly affect this logistical support capability.

LOGISTICS CHARACTERISTICS

Scarce resources require logistics operations to be efficient, not wasteful. Logistics operations must be effective to provide the intended or expected support; therefore, successful logistics support must be balanced between effectiveness and efficiency. Logistics operations are characterized by being able to anticipate requirements, integrate joint and multinational logistics support, and improvise solutions and by being responsive and continuous. These characteristics facilitate effective, efficient logistics support and enable operational success. They apply in both war and OOTW. These imperatives act as a guide for planners and operators to synchronize logistics on the battlefield. The corps engineer unit commander and his staff understand and use these imperatives while planning engineer operations. The following paragraphs describe these characteristics along with corps engineer considerations for each.

Technological advances are producing new or reshaping existing TTP that the 21st century Army commander will use with in the digitized battle space. As stated earlier in this manual, digitalization and technology enable the FXXI corps and its divisions to cover wider fronts. These same advances also increase the depth of the modern battle space. The ability to see deeper with long-range air and ground sensors, track enemy movement with accuracy, maneuver with precision, and strike where and when the enemy least expects results in increased operational tempo (OPTEMPO).

The digital systems of the FXXI corps, when properly leveraged, provide the SA and RCP needed to facilitate combat operations and the logistics support required to sustain those operations. However, commanders and staffs at both the combat and CSS levels must ensure that the information provided them is not only accurate and timely but also relevant. Acting on relevant analyzed and fused information related to both enemy and friendly activity, logistical planners can ensure that supplies are pushed forward to the right place and time, and in the right numbers.

The anticipated technological gains expected by Army decision makers have driven a change in

CSS force structure and doctrine. For example, the CSS structure is moving from a transportation-based to a supply-based distribution system. Inherent in this change is an increased dependence on corps assets to throughput supplies to the division using "velocity management" due to reductions in logistics capabilities at the division level. In addition, there will be an increased number of corps units in the division sector. Total asset visibility (TAV) and in-transit "pipeline" visibility of supplies moving from corps to division can be managed and distributed more effectively using improvements such as the—

- CSSCS.
- Radio frequency tag.
- Palletized loading system-enhanced (PLS-E).
- Movement tracking system (MTS).

The CSSCS is the logistician's automated management tool. It also provides visibility of unit requirements and support capabilities by collecting, processing, and displaying information on key items of supply, services, and personnel that the commander deems crucial to the success of the operation.

Corps engineer force sustainment is critical in maintaining the combat power of the corps and its divisions. Logistical operations sustaining corps engineer activities must be accurately anticipated and forecasted to meet engineer needs.

The corps engineer unit commander of an analog unit and his staff must understand and consider the logistics imperatives discussed in the succeeding paragraphs and CSS operational characteristics while planning engineer operations. The following paragraphs describe these characteristics along with corps engineer considerations for each.

ANTICIPATION

To anticipate means that the corps logistics planner is proactive rather than reactive before, during, and after combat operations. Corps logistic planners look at least 72 hours into the future. Corps logisticians consider joint, multinational, and host-nation assets when planning support for engineer operations. They maximize the use of all available resources, especially host-nation assets. They prioritize critical logistical activities based on the concept of operations. They anticipate logistical requirements based on experience and historical knowledge. They concentrate on critical war-stoppers first, then move to the item next in priority. They participate in and evaluate the logistical significance of each phase of the operation during the entire command-estimate process, to include: mission analysis; course-of-action (COA) development, analysis, war gaming, and recommendation; and execution of the plan. Various phases of force-projection operations can help describe anticipation requirements for corps engineers.

Predeployment and Deployment

If possible, before hostilities begin, the logistics organization first envisions and then becomes

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arranged LOGCAP contracts can also provide these services.

- Foreign/host-nation civilians or third-country nationals. These civilians can perform a wide array of services for the commander. Some of the civilian skills that may be required include construction laborers, linguists, stevedores, truck drivers, rail operators, air-traffic controllers, utility specialists, and technicians.

- Foreign/host-nation military units. Foreign/host-nation military or paramilitary units support wartime functions such as traffic control, convoy escort, installation security, cargo and troop transport, fuel storage and distribution, and rear operations.

- Foreign/host-nation facilities. The use of existing foreign/host-nation facilities can relieve the commander of the need for a great deal of new construction. Such facilities as billets, maintenance shops, medical and dental clinics or hospitals, logistical activities, and recreational areas can be provided by a contractual agreement.

- Supplies and equipment. The availability of critical supplies is highly dependent on the TO. Such things as construction materials (lumber, bricks, concrete, asphalt, and so forth), construction equipment and tools, and obstacle materials will drastically reduce engineer lift requirements into the TO.

METT-T analysis determines the ultimate decision to use foreign/host-nation assets and appropriate foreign/host-nation support battle command. Consider the following factors in determining the suitability of using foreign/host-nation resources to accomplish logistics-support missions and functions in the area of responsibility (AOR):

- The effect of the failure of compliance with a foreign/host-nation asset on US security.

- The reliability of the foreign/host-nation support provided.

- The capability, dependability, and willingness of the foreign/host nation to provide and sustain identified resource needs.

- The political, social, and economic considerations associated with the use of foreign/host-nation assets.

- The risk associated with foreign/host-nation support being unavailable in wartime in the type and quantity agreed upon.

CONSTRUCTION CONTRACTING ACTIVITIES

The majority of logistical contracting actions will be accomplished by the corps G4. Corps combat engineer forces will not normally get involved with normal contracting actions in the TO. The corps engineer assists the corps G4 in coordinating construction contracting actions being accomplished by the foreign/host nation and the USACE by identifying requirements in terms of US engineer force equivalents. The forward-deployed USACE command (USACE (FWD)) may be part of the Army component of a JTF and yet respond directly to the JTF commander through the JTF engineer on contract construction issues. The USACE (FWD) may also be engaged in real estate leasing operations as well as other Army support missions (for example, maintenance of the Theater Construction Management System (TCMS), water detection, and so forth). To the extent that the corps requires USACE support, USACE (FWD) may place a liaison cell with the corps SES and/or, if required, a contract execution section with the corps engineer brigade headquarters. Regardless of the ultimate arrangements for support, the ACE and the USACE (FWD) com-

mander will work closely together to ensure that the corps's engineering contracting needs are met.

LOGISTICS CIVIL AUGMENTATION PROGRAM

The LOGCAP is a DA program that provides responsive contract capability to augment US forces with facility and logistics services during contingencies/wartime. As the program's executive agent, the USACE provides program management, coordinates LOGCAP requirements with supported major Army commands (MACOMs), and administers the LOGCAP contract. The G3, the G4, the corps engineer, and the comptroller are key players in developing LOGCAP requirements and ensuring the appropriate mix of contractor and troop support. Three major types of activities are supported by the worldwide LOGCAP contract: facilities operations, maintenance, repair, and construction; all other nonfacility logistics services (for example, POL, transportation, food/water, and maintenance); and contractor planning expertise to assist MACOM/contingency planners. LOGCAP is especially suited to support reception, staging, and onward movement (RS&O) operations. Additionally, LOGCAP can augment engineer units (operate Class IV supply yards and provide construction equipment), provide facility engineer support, and support COMMZ-oriented construction.

CAPTURED ENEMY RESOURCES

Captured enemy resources are another asset that may become available during combat operations. Corps engineer use of captured obstacle and construction materials, mines and demolitions, and engineer equipment can significantly reduce logistical requirements in the AOR with appropriate safety awareness and operational training. Food, POL, water, and medical supplies can be used to support EPW camps or holding facilities. Captured facilities can be used in a variety of ways to support logistics operations.

SUPPORTING OPERATIONS OTHER THAN WAR

OOTW may require the same or a greater level of logistical support as wartime operations. Combatant commanders tailor logistics support of these operations based on theater needs. In some cases, logistics-support units and corps engineers may be the only forces involved in the theater. The logistical operation may be the main effort in certain situations, such as humanitarian-assistance operations. Corps logistics efforts are integrated with host-nation or local resources and activities. The wide variety of potential support requirements demands a flexible logistics structure tailored to theater missions. Corps engineers invariably get involved with a wide variety of missions that may need flexible logistics support. Critical engineer logistical considerations during OOTW include the availability of construction equipment, DS maintenance capability, repair parts supply, Class IV construction materials, and the need for engineer LOs.

CORPS LOGISTICS OPERATIONS

Corps logistics elements are organized to provide military forces with supply, maintenance, transportation, medical, personnel, finance, and field services. Corps units are supported by the COSCOM whether they are operating in division, separate brigade, cavalry regiment, or the corps rear areas (see Figure 4-1). The COSCOM provides corps-level logistics support and health-services support to corps units and theater units attached to the corps. Corps units attached to divisions are supported by the DISCOM. Recent divisional logistics restructuring, to include some CSS functions being passed back to corps, and the incorporation of a distribution-based supply system has left the divisional logistically lean. When engineer echelon-above-division (EAD) units are attached to the division, the division and corps staffs must coordinate for corps support packages to be pushed to the division to augment CSS support due to the division's limited capability to support attached units. All

other corps units operating in division areas receive logistics support from COSCOM units operating in the division AO. Health-services support for

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corps medical brigade provides medical support, and a transportation group may be assigned to the COSCOM. Personnel and finance support are provided by functional commands. A task-organized DS battalion from the CSG normally sustains corps engineer units deployed in division areas. To support forward corps units, including engineers, these COSCOM units habitually locate in the vicinity of division rear boundaries to render timely effective support. However, some corps engineer units may operate too far forward for the COSCOM to provide support, such as corps engineer battalions supporting cavalry regiments. In these cases, the maneuver unit will normally be logistically augmented by the COSCOM to provide needed support to the forward corps engineer units. Corps engineer units operating in the corps rear area will normally be sustained by CSG support units and systems, usually on a supply-point basis. All corps engineer units directly establish individual logistics accounts with various COSCOM support agencies in theater.

COMMAND AND SUPPORT RELATIONSHIPS

Command and support relationships determine how corps engineer units will be sustained. Normally, division forward support battalions do not have the capability to sustain corps engineer units logistically. For this reason, most corps engineers are placed in DS or OPCON roles to maneuver forces. Parent corps engineer organizations track subordinate unit missions and their status in order to properly allocate and provide sustainment resources from the corps. Corps engineer units are rarely attached to maneuver or other units because it requires the supported unit to provide logistical support except for personnel and administration activities. Command and support relationships can be altered to fit various situations. For example, theater engineers on a task in the corps area will be supported by the COSCOM. Corps engineers operating in a division area may receive support of common classes of supply and limited vehicle maintenance support from the DISCOM and its Division Support Battalion (DSB) and Forward Support Battalions (FSBs) depending on the Corps Engineer unit locations. Regardless of the command or support relationship, all corps engineer units must exchange logistics coordination and status information through engineer channels to the corps engineer brigade CP. See Figures 2-9 and 2-10, concerning corps engineer logistics information flow.

PERSONNEL-SERVICES SUPPORT

Personnel-services support is the management and execution of personnel services, resource management, finance services, chaplaincy activities, command information services, and legal-service support.

The S1/G1 has staff responsibility for coordinating personnel-services support. Religious, legal, and public-affairs support is provided by elements organic to engineer units. Morale, welfare, and recreation (MWR) support is provided by the command and a variety of external agencies.

Personnel support is provided through the personnel groups who exercise C2 over subordinate elements, including personnel-services battalions, postal companies, replacement companies, and bands. These elements operate on both area and DS bases and support both division and nondivision units. Personnel and administration services include strength and personnel accounting, casualty reporting, replacement operations, awards, military personnel management, Red Cross services, and civilian personnel management. For doctrine on personnel and administrative support, see FM 12-6.

Finance support is provided through the finance group and its subordinate finance battalions, which have the capability of fielding finance detachments. These units provide military pay, disbursing, travel, and commercial vendor service on an area-support basis. For doctrine on finance support, see FM 14-7.

Figure 4-3 shows the corps personnel strength accounting channels used by engineers on the battlefield. Figure 4-4 shows how engineer replacements are managed in the corps's AO. Figure 4-5, page 4-14, shows area and corps finance support.

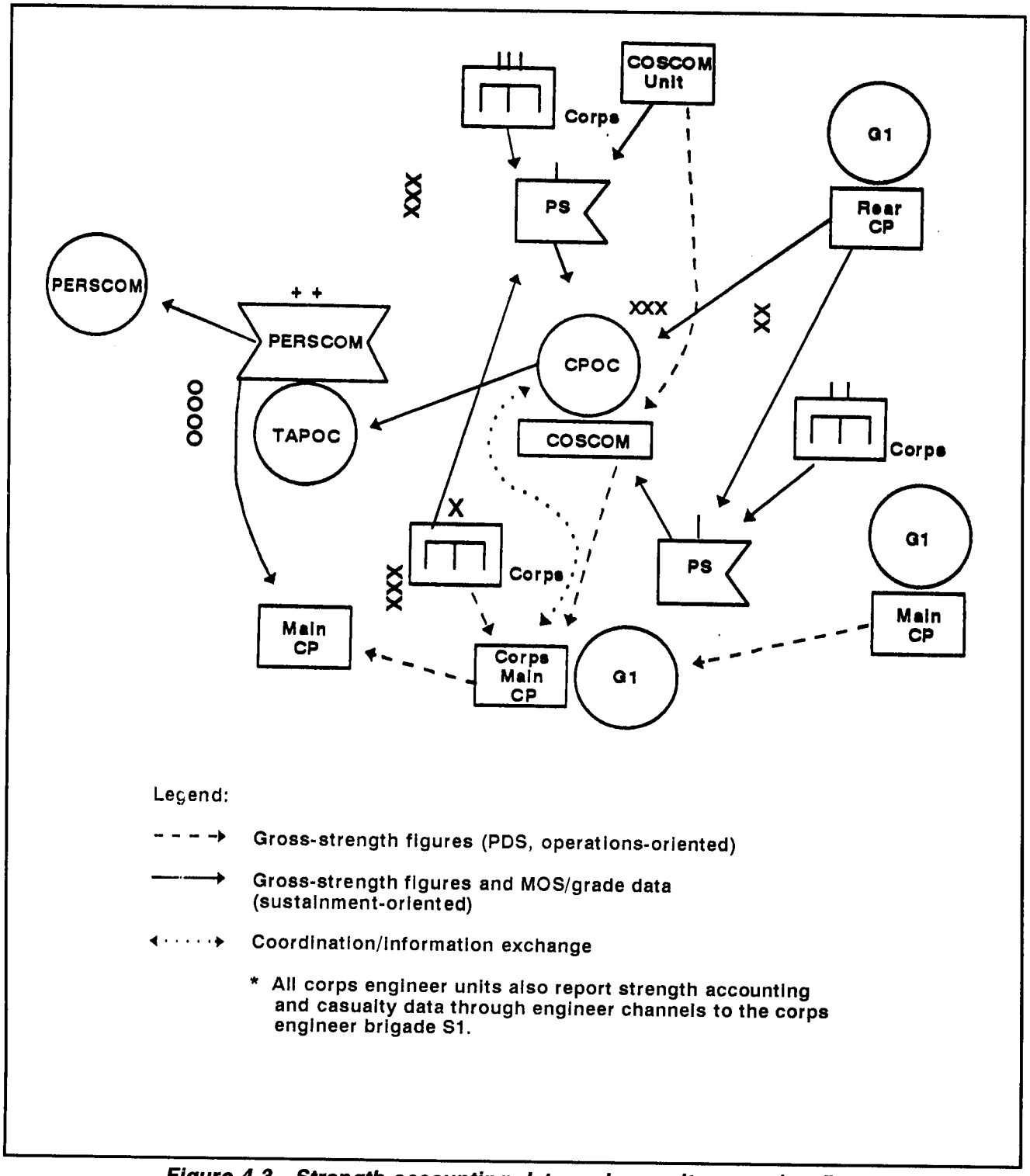

Figure 4-3. Strength accounting data and casualty reporting flow

CHAPTER 5
OFFENSIVE OPERATIONS

Great tanks fitted with special mine plows and rakes jump forward clearing initial paths through obstacles. Combat engineers position mine-clearing charges immediately behind the tanks. When minefields are discovered, engineers fire a rocket over the tanks that pulls out a long line of explosives. The line charge is then detonated, creating an unbelievable blast. This marks a lane, clears some mines, and renders any enemy troops in the area completely ineffective. Bulldozers have been fitted with special steel protection. They push into the breach, clearing and widening each lane. The M9 armored combat engineer vehicle is used to attack bunkers and trenches with its sturdy blade. There is resistance, but Iraqi soldiers begin to surrender in large quantities. Those that stay and fight are quickly overrun. The tanks are busy destroying Iraqi tanks and fighting vehicles. Engineers are clearing bunkers and blowing up enemy equipment. The M9 armored combat earthmover (ACE) crushes bunkers and destroys trenches. Those who do not surrender are covered and crushed. Within minutes, eight lanes are opened through the first obstacle belt. In short order, sixteen lanes are opened, marked, and divided for one-way, two-way, wheeled, or tracked traffic. Everywhere there are engineers blowing up enemy fortifications. Giant engineer equipment pushes aside debris and roads appear in the desert. Everywhere there is noise, dust, smoke, and the deafening roar of gunfire. It is synchronized perfectly.

From "A Commanders Perspective" by Colonel Samuel C. Raines, Commander, 7th Engineer Brigade (Corps), during Operation Desert Storm, 9 April 1991.

PURPOSE OF THE OFFENSE

The corps conducts offensive operations to defeat, destroy, or neutralize the enemy force. The offense is the decisive form of war. Offensive operations are designed to defeat the integrity of the enemy's defense system by driving into his rear and destroying artillery, reserves, C2 systems, CPs, and logistics support. These operations may also be conducted to secure key or decisive terrain, to deceive or misdirect uncommitted enemy forces, to fix or isolate units, to gain information, or to spoil an enemy's offensive preparation. Seizure and retention of the initiative come with offensive action. Corps are expected to conduct offensive operations to defeat or destroy a designated portion or formation of an enemy's defense. A corps may conduct an offensive operation as part of a TA operation, independently as the Army component of a JTF, or internally as part of its own operation.

This chapter provides a doctrinal foundation for corps engineer support to offensive operations. It serves as an extension of FM 100-15. It examines how corps engineers fit into the offensive framework and assist the corps in achieving success. The engineer estimate focuses on the process used to meet the needs of corps offensive planning.

OFFENSIVE CHARACTERISTICS

The offensive operation is the corps's primary means of taking and maintaining the initiative. Successful engineer support of corps offensive operations depends on the corps engineers understanding and application of the four offensive characteristics: surprise, concentration, tempo, and audacity.

SURPRISE

Surprise is achieved by striking the enemy at a time or place or in a manner for which it is not physically or mentally ready. To give the corps the element of surprise, corps engineers overcome operational and tactical obstacles rapidly and provide the corps with mobility over restricted terrain. Corps engineers also prepare forward logistics bases, assisting in the rapid forward movement of corps forces.

Advanced engineer systems such as Grizzly and Wolverine, as they are received by the FXXI corps and division engineers, will enhance the flexibility and speed with which existing and reinforcing obstacles can be crossed or breached to maintain operational tempos of the maneuver force. By rapidly overcoming operational and tactical obstacles and providing the corps's mobility over restricted terrain, surprise can be achieved. Timely positioning of bridging and engineer follow-on corps engineer forces are some of the support techniques that are easily coordinated within digitally equipped units. Rapid dissemination of detailed terrain graphics to exploit the advantages of the existing terrain also assists in achieving the element of surprise.

CONCENTRATION

Concentration is achieved by massing the effects of combat power at the point of attack. The corps engineer task-organizes and develops a scheme of engineer operations that supports this concentration of maneuver forces by massing the right type of engineer support at the right place and time. Allocating the proper mix and amount of corps engineers to divisions that are making the main corps attack permits them to adjust to changing circumstances without time-consuming and confusing reorganizations. The massing of corps engineer general engineering support to corps logistics operations may also be appropriate to ensure adequate corps logistics support during the attack such as MSR construction immediately following combat formations.

In the FXXI corps, the corps engineer will use all his ABCS and other FXXI systems to remain abreast of the tactical situation. With his enhanced SA and RCP, the corps engineer can—

- Better anticipate new or emerging engineer requirements.
- Recommend more accurate engineer task organization based on intelligence, logistics considerations, and terrain analysis.
- Expedite staff planning and coordination with corps staff elements using digital systems.
- Rapidly disseminate tentative plans, WARNORDs, and initial overlays.
- Conduct rehearsals.
- Begin precision movement.

One of the most important contributions made by the FXXI corps engineer is the ability to provide terrain analysis and topographic products that will support movement and massing of forces. Engineer digital systems that will provide information and information products to support this capability include the DTSS and, when fielded, the Land Warrior.

TEMPO

Tempo is the rate of speed of military action that maintains relentless pressure on the enemy to prevent him from recovering from the shock and effects of the attack. Corps engineers help achieve this tempo by maintaining a responsive engineer C2 system and decision cycle. Establishing corps engineer task organizations and command or support relationships that do not change during the course of the battle allows the maneuver forces to retain relentless pressure against the enemy.

In the offense, each of the FXXI corps's digitally equipped division engineers is focused on ensuring that the maneuver commander has the flexibility required to conduct speedy movement, overcome existing and reinforcing obstacles rapidly, and assist with deep strike operations. The speed with which each division's engineer conducts mobility operations is key to the maintenance of OPTEMPOs. As the Grizzly and Wolverine are fielded, these systems will significantly improve the engineer's ability to support fast-moving tactical operations through improved in-stride breaching capability. The ability to share tactical and terrain information rapidly and to coordinate and synchronize actions on the move enhances the positioning of engineers and their assets to meet rapidly changing support requirements. For example, the Grizzly and Wolverine will be equipped with the FBCB2. Information disseminated by these mobility systems will be shared with corps and division engineers enabling them to track the current status of obstacle and breaching operations. This improved tracking and information sharing capability enables timely decision making and provides for the early identification and coordination of additional engineer support allocations as required.

AUDACITY

Audacity is required to boldly execute simple plans that negate the disadvantages of numerical inferiority. Commanders understand when and where they are taking risks but don't become tentative in the execution of plans. The corps engineer facilitates audacious offensive action by seeing the battlefield and anticipating future engineer requirements. He constantly postures the engineer force so that the corps can rapidly take advantage of narrow windows of opportunity such as in the case of forward river crossings.

FORMS OF THE CORPS TACTICAL OFFENSE

Successful engineer support of corps offensive operations also depends on the corps engineer's understanding and ability to support the four forms of the tactical offense: movement to contact (MTC), attack, exploitation, and pursuit.

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MOVEMENT TO CONTACT

The corps conducts an MTC to gain or regain contact with the enemy and to develop the situation. The MTC is characterized by rapid movement along multiple axes, centralized planning and decentralized control, and the rapid transition of combined arms formations from the march to the attack. The corps focuses on intelligence collection and security to the main body. During the MTC, the corps is normally organized with a covering force, an advance guard, a main body, and flank and rear security elements. A variant of the MTC is the approach march, used when commanders are relatively certain of the enemy's location and are a considerable distance from the enemy. Limited-purpose applications of the MTC include the *search and attack*, conducted by light maneuver units or air cavalry, and *reconnaissance in force*, conducted by heavier units. Both operations seek enemy information and probe for enemy weaknesses; or they may deny terrain to the enemy, and possibly destroy the enemy. The desired result of the MTC is to find the enemy.

In the FXXI corps, an MTC may not be necessary. With its vast array of airborne and ground sensors, the corps will be able to locate, track, target, and attack the enemy, in-depth, at significantly greater distances. These deep attacks are performed using a mix of deep attack weapons platforms such as the Multiple-Launch Rocket System (MLRS), Crusader, Paladin, Comanche, LBA, SCATMINEs, and maneuver forces to shape the battlefield and destroy the enemy in detail before reaching the MBA. Though not yet equipped with Raptor ICO, this system, when fielded, will add significantly to the corps's ability to collect intelligence through its sensor arrays. Additionally, it can be used in an economy of force role and remotely detonated.

An MTC has several possible outcomes. First, a corps may not make contact with the enemy and reach its objective unopposed. This could result in continuing the MTC to a subsequent objective or establishing a hasty defense oriented on key terrain. Second, a *meeting engagement* may occur where the corps meets an unexpected moving or stationary force and where friendly action takes place without hesitation. If the covering force or the unit in contact is unable to defeat or contain the enemy force, the corps will rapidly decide to conduct a hasty attack, hasty defense, or a combination of both, normally with units from the main body. Another possibility is to bypass the enemy force altogether. When the corps has a clear picture of a moving enemy's disposition, it may try to gain the advantage by moving to advantageous terrain and preparing for a hasty defense, hasty attack, or a combination that destroys the enemy force.

The FXXI and the analog corps engineers support an MTC by configuring corps engineer forces forward to accomplish needed mobility, countermobility, general-engineering, and limited survivability operations. Both engineers understand the MTC's objectives, contingencies, branches, and sequels. However, the FXXI corps engineer is better able to anticipate and adjust to changes based on an enhanced SA, a RCP, and the ability to share critical information, electronically, via digital systems. Both corps engineers will consider each component of the MTC and the inherent engineer missions that are performed in support of the covering force; advance, flank, and rear guards; and the main body. Based on available forces, equipment, and C2, corps engineers will recommend the appropriate task organizations to the G3.

Using his enhanced SA and digital C2 systems, the FXXI corps engineer can quickly initiate planning, assign new missions, and modify task organizations as the tactical situation demands. Both the FXXI and the analog corps engineer will ensure that the use of SCATMINEs are properly integrated and synchronized to support the deep operations and the MTC requirements. In the FXXI corps, digital overlays will compliment this

synchronization and integration process. Once fielded, the Raptor ICO becomes an invaluable tool to be used in the support of deep operation as both an early warning/ intelligence gathering system as well as trigger for the initiation of deep attacks. The proper integration and synchrozation of SCATMINEs and Raptor ICO ensures that emplacement times, lanes, and duration facilitate both current and future operations.

The corps engineer supports the MTC by configuring corps engineer forces forward to accomplish needed mobility, countermobility, general engineering, and limited survivability operations. The corps engineer understands the MTC's objective, contingencies, branches, and sequels. He then identifies engineer tasks and allocates forces. Figure 5-1, shows the basic engineer tasks germane to a corps MTC. The corps engineer considers each component of the MTC and the inherent engineer missions that are performed in support of the covering force; advance, flank, or rear guards; and the main body. He then task-organizes units based on his available forces and C2 requirements. He ensures that deep operations scatterable mining is fully synchronized during the MTC so that emplacement times, lanes, and durations facilitate future corps operations. Figure 5-2, shows a possible engineer force laydown to support the engineer missions needed during an MTC.

Covering Force

The corps normally uses the cavalry regiment as the covering force but may use a division or separate brigade. In addition, the corps commander may direct that leading divisions establish division-controlled covering forces in support of the MTC. The corps covering force dvelops the situation and prevents the unnecessary delay of the main body. Covering-force missions include destroying enemy resistance, securing key terrain, or containing enemy forces. When attacking a defending enemy army, the corps covering force is usually expected to penetrate the enemy's security zone, identify the location and deployment of forces in the main defensive belt, and limit the enemy's intelligence-gathering activities.

Engineer support for the corps covering force includes reconnaissance (to gain terrain and enemy engineer intelligence) and mobility operations (to sustain the covering force's freedom of maneuver). Engineers help identify the best routes for forward movement along with lateral

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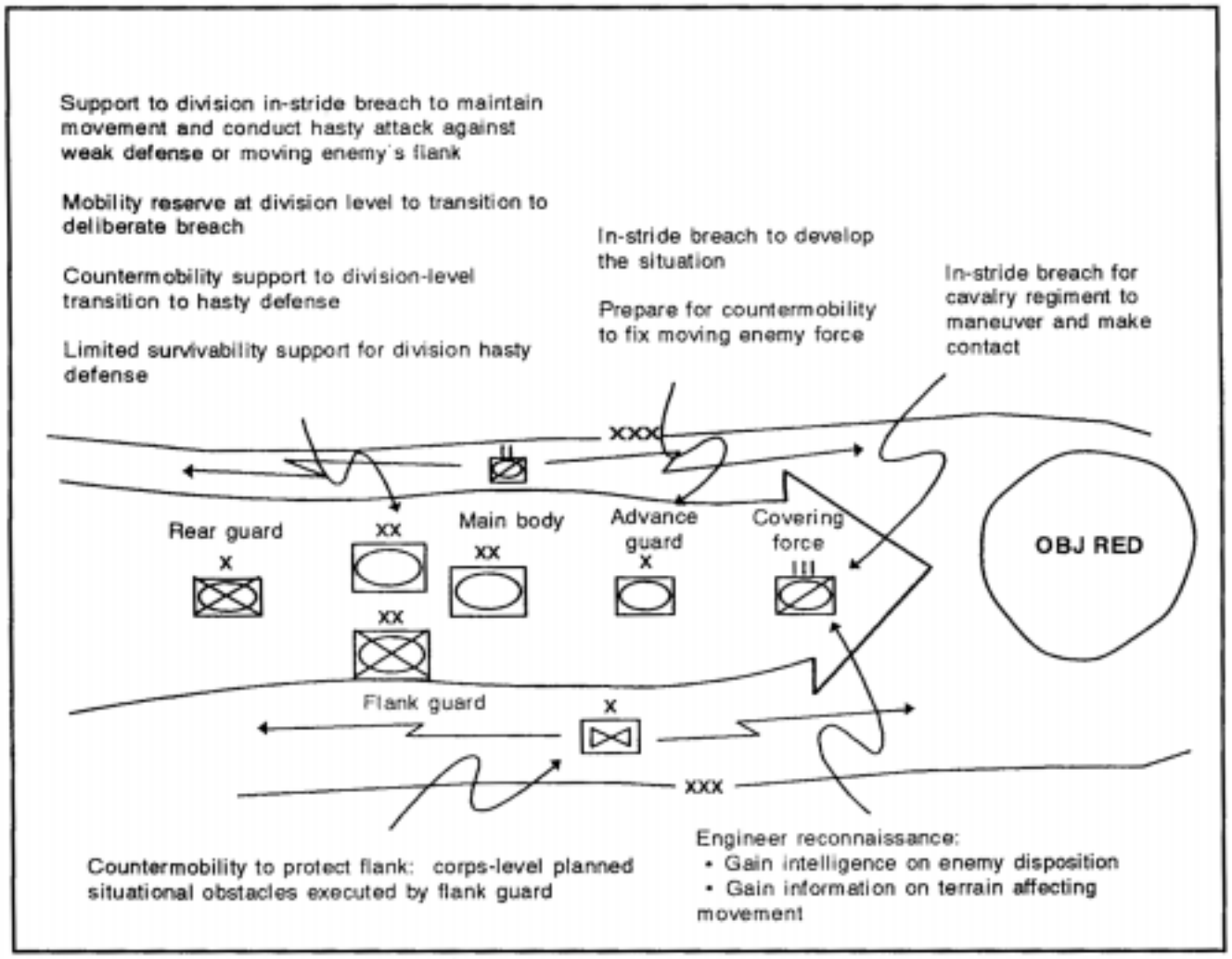

Figure 5-1. Engineer support to a corps MTC

routes for additional flexibility. Engineers with the covering force allow it to move independently through undefended obstacles and restrictions.

FXXI engineer reconnaissance teams, operating as part of the covering force, will gather and report data via FBCB2 and frequency modulation (FM) voice to their higher HQs. A TTP that should be used is to provide digital reports via the FBCB2 and MCS as a backup to those reports submitted by FM voice. These reports include the SITREP, SPOTREP, and size activity location unit time and equipment (SALUTE). The Land Warrior system, when fielded, will provide the dismounted reconnaissance engineer the ability to instantly report position and precise dimensional detail on items of interest. These items include enemy obstacles, breached lanes, critical structures, and any mobility conditions affecting routes and bypasses. See FM 5-170, Appendix H.

The cavalry regiment or separate brigade will normally have a corps engineer battalion attached, augmenting organic engineer company capabilities to allow for rapid earth moving, minefield breaching, and assault bridging. If the corps covering force is a division, the organic division engineer brigade or battalion normally provides support for engineer missions. Engineer support to covering-force operations is characterized by early

linkup, detailed combined arms planning and rehearsals, and thorough integration into the combined arms team.

Advance Guard

The corps advance guard is normally furnished and controlled by the leading divisions in the main body. The advance guard maintains contact with and provides liaison to the covering force. It is task-organized to support the uninterrupted movement of the main body. Engineer support for this operation normally comes from the leading division engineer brigade or battalion. The corps engineer may augment with bridging and breaching assets. The primary mission of the engineer force supporting the corps advance guard is to maintain the advance guard's freedom to maneuver with mobility support, allowing it to fight through defended obstacles without reinforcement.

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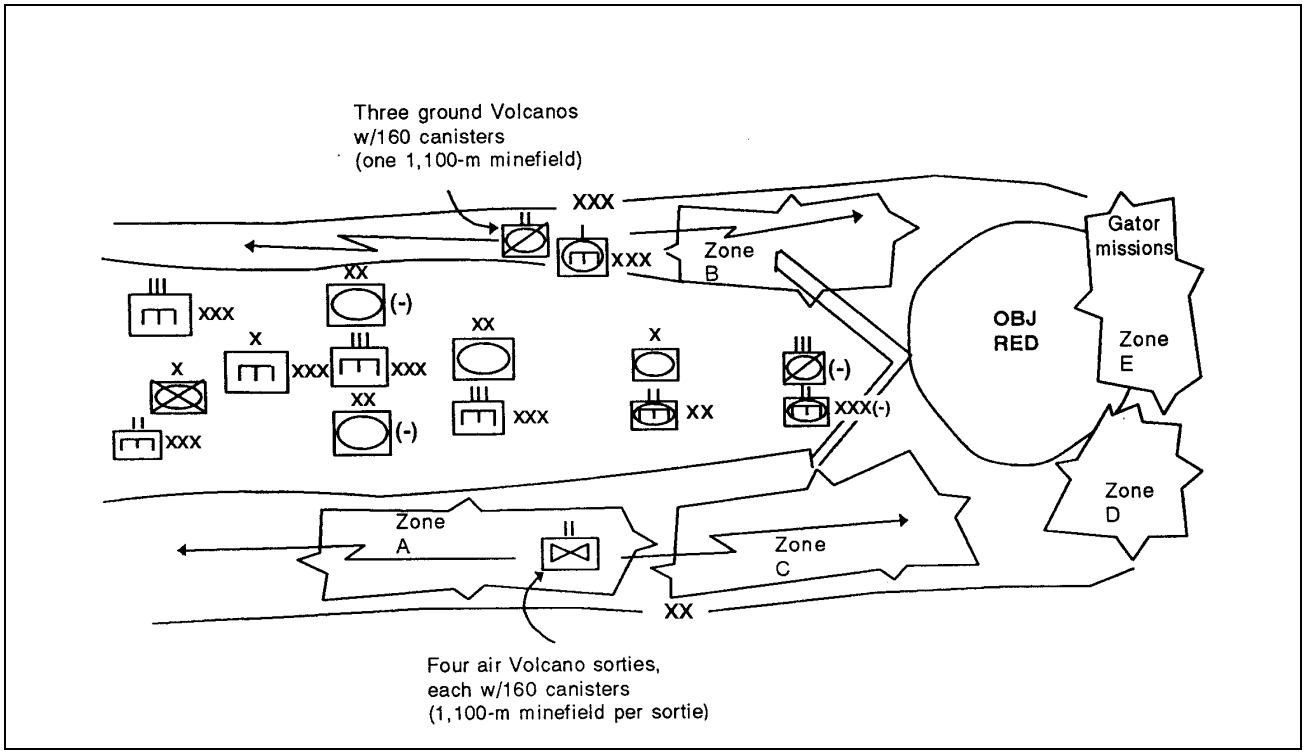

Figure 5-2. Engineer force laydown to a corps MTC

Engineers with the advance guard assist in rapid movement, develop the situation, and maintain the momentum of the main body. In-stride breaches are conducted along routes where the main body is moving. The advance guard may require countermobility support, especially if the intent is to fix the enemy and allow the main body to attack a flank. Situational obstacles are planned and executed as required.

Flank and Rear Security

Corps flank security is normally furnished and controlled by main body forces. If flank security forces are required to be under corps control, specific security missions (normally screen or guard) are assigned to these units. While there is not necessarily a dedicated engineer force with the flank security force, countermobility support is an inherent task. Situational obstacle emplacement will normally be the responsibility of main body division engineers or corps engineers supporting screening or guarding cavalry regiments and separate brigades.

If there is a main body division engineer element assigned to the flank security element, the corps's staff engineer section must ensure that it is properly augmented to accomplish countermobility support. This augmentation includes personnel, equipment, and special-purpose munitions. For example, the FXXI division engineer of a FXXI corps supporting a flank security mission should be equipped with the Hornet PIP and Volcano mines. If the flank security element is to protect the corps's boundary, the corps's staff engineer staff section should consider equipping the division engineers with such systems as air Volcano, Gator, and if available, Raptor ICO.

The corps engineer also identifies and uses topographic products, produced by the DTSS terrain-analysis team, to facilitate terrain visualization and the placement of the obstacle zones. Obstacle overlays, created during the planning process, are digitally shared via the MCS-ENG linked to the engineer elements supporting the flank guard. These products may be updated using digital information gathered by the engineer elements of

the covering force and transmitted to the division and corps engineers and terrain teams.

The corps normally controls rear security forces due to the extensive distances created by supporting logistics forces. Countermobility support, including situational obstacle planning and emplacement, is also inherent to support rear security operations. The corps engi-

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neer plans corps reserve demolition targets and ORAs to ensure freedom of maneuver in the corps rear area. The Hornet PIP, with a program that distinguishes between wheeled and track vehicles and a countermobility remote control system (CIRCE) with on and off capability, is an ideal system to support rear security missions.

NOTE: When Hornet PIP is used, special considerations must be given to the system's mission & obstacle intent, emplacement criteria, emplacement team tasking, sensor-to-shooter communication requirements, C2, target selection and execution criteria, and battle handoff procedures.

Main Body

The main body contains the bulk of the corps's combat power. Units are task-organized into march columns to facilitate a hasty attack or a hasty defense from the march. Elements of the main body may be committed to reduce pockets of resistance contained or bypassed by the covering force. Engineers supporting the main body focus primarily on forward mobility and countermobility operations. Corps engineer battalions augmenting divisions widen breached lanes, breach bypassed obstacles, and emplace situational obstacles on the flanks. Corps bridging units are located in march columns for responsive support to the main body. CSE companies and combat heavy engineer battalions construct follow-on MSRs and logistics bases.

ATTACK

The attack's purpose is to defeat, destroy, or neutralize the enemy. The same fundamentals apply to each type of attack. Attacks with enemy-force objectives are preferable to terrain-oriented objectives. The corps will normally transition into an attack following an MTC, but the attack may also occur after defensive operations, exploitations, and pursuits. Successful attacks depend on the skillful massing of fires, maneuver, EW, and other effects against the enemy force. To defeat the enemy force, the corps attacks to destroy the continuity of the enemy defense by making the enemy positions untenable so that he either abandons his defense or eventually faces piecemeal destruction. To destroy the enemy force, the corps achieves overwhelming combat power through the use of fire and maneuver. When attacking a comparable-size force, the corps accepts risks in a part or parts of its zone of action to achieve concentration at decisive points while using deception and economy of forces in other areas. Several forms of the attack may be used by the corps commander, including the hasty attack, deliberate attack, spoiling attack, counterattack, raid, feint, demonstration, or any combination thereof.

The corps engineer supports attacks by configuring corps engineer forces to accomplish needed forward mobility, countermobility, general engineering, and limited survivability operations. The corps engineer understands the attack's objective, contingencies, branches, and sequels. He then identifies engineer tasks and allocates forces. He considers each type of attack and the inherent engineer missions that are performed. He then task-organizes units based on his available forces and C2 requirements. He ensures that deep operations scatterable mining is fully synchronized during the attack so that emplacement times, lanes, and durations facilitate future corps operations.

Hasty Attack

The hasty attack is an offensive operation with minimum preparation by the unit in contact with the main body. The attack destroys the enemy before he can concentrate forces or establish an effective defense. It is the most likely result of a meeting engagement. A corps uses hasty attacks from the march with main body units and covering forces that are immediately available. The hasty attack may be conducted as part of a planned contingency during an MTC or as an unforeseen contingency during hasty or deliberate defenses and deliberate attacks. Sound IPB and prior war gaming of situations, battle drills, and rehearsals are critical to success. The hasty attack is normally ini-

tiated by the use of FRAGOs. It is followed by the use of reserve forces or immediate reinforcement.

Hasty attacks may be rarely performed in the FXXI corps. With the advent of improved air and ground sensors, information voids that previously took hours or days to fill are now filled on a real or near-real time basis. Intelligence is far more accurate and predictive with satellite and aerial platforms such as UAV, JSTARS, Comanche, and LBA, providing imagery that will often confirm the enemy's location, disposition, and direction of movement. This ability to track enemy movement and conduct precision movement based on highly accurate terrain analysis provides the corps commander the ability to prepare deliberate versus hasty attacks quickly.

Prior to the attack, the corps engineer anticipates and task-organizes needed engineer forces to provide responsive support to divisions, separate brigades, cavalry regiments, and reserve forces without delays. Figure 5-3 shows the basic engineer tasks germane to a

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command estimate (see Figure 5-5). The corps engineer thoroughly understands the corps commander's intent and scheme of maneuver; anticipates how divisions, separate brigades, the cavalry regiment, and reserve forces will fight; and comprehends the threat situational template in order to properly conduct the engineer mission analysis. The corps engineer then looks at the maneuver-brigade level and identifies the number of lanes or crossing sites required for each brigade, regiment, or reserve force. He then compares the capabilities of division, separate brigade, cavalry regiment, and reserve force engineer units to the numbers of required lanes or crossing sites. If a shortfall exists, he allocates available corps engineer battalions and/or bridge companies to the appropriate division, separate brigade, cavalry regiment, or reserve force. If required, he allocates engineer group headquarters to divisions in order to bolster engineer C2. Countermobility and survivability operations are also significant in supporting a deliberate attack. Countermobility operations assist in isolating the battlefield and protecting the corps from enemy flank attack and counterattack. The corps engineer understands the corps commander's intent, follow-on missions, and contingency plans to allocate engineer forces to support them. Using the corps's DST and the synchronization matrix, the corps engineer estimates the time available to conduct needed corps countermobility operations, including the transportation of ob-

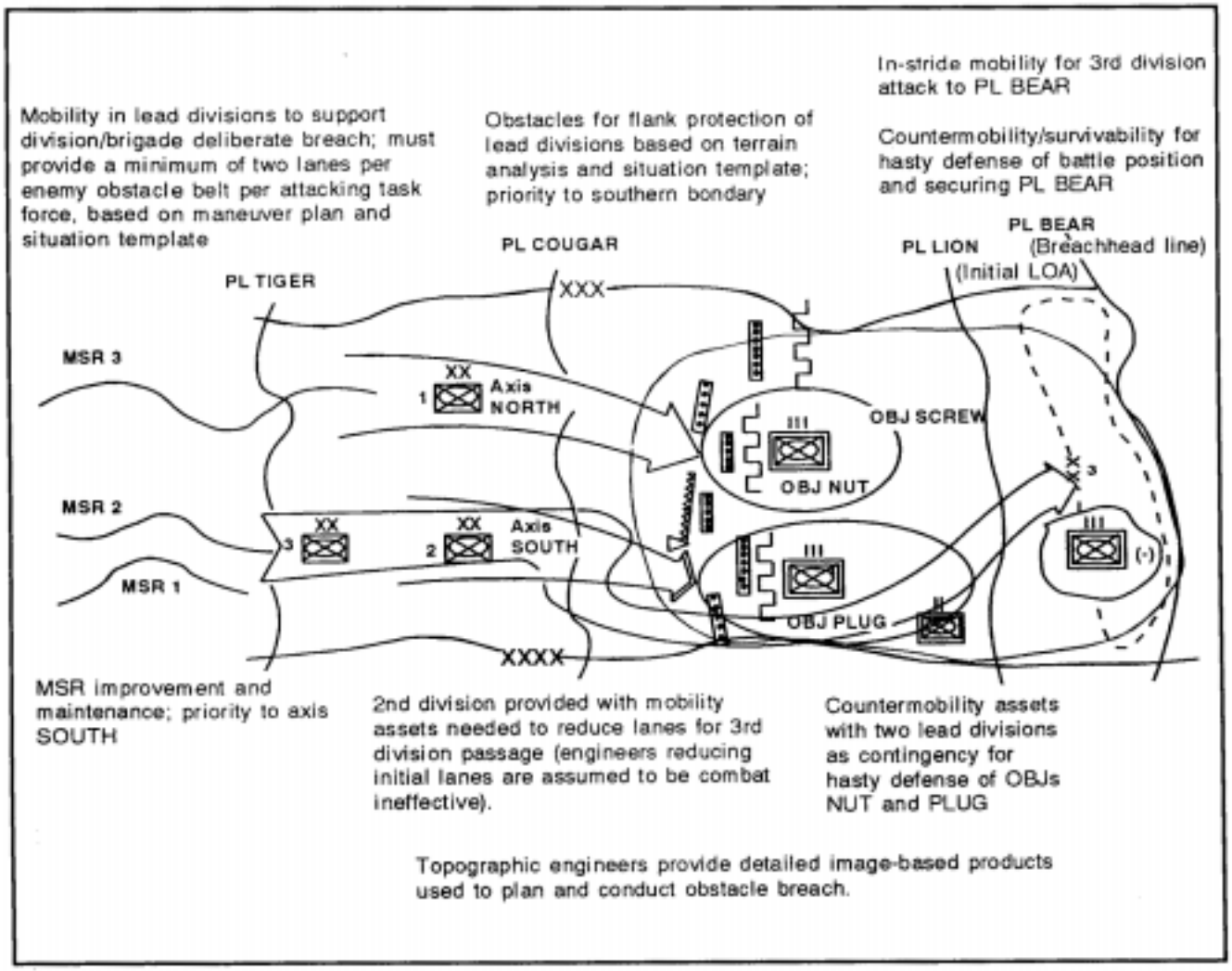

Figure 5-5. Engineer support to a corps deliberate attack

stacle material to corps-directed obstacle locations. He coordinates with the COSCOM to ensure that mission-required Class IV obstacle materials and Class V mines and demolitions are pushed forward to support a hasty defense on the objective and to corps-directed obstacle locations. He influences countermobility operations during the deliberate attack's execution by tracking the battle and advising the corps commander on the use of deep scatterable mines. The corps engineer supports survivability operations by ensuring that divisions, separate brigades, the cavalry regiment, and reserve forces have sufficient earth-moving assets in their task organization. General engineering support to build and upgrade MSRs and logistics bases is required to exploit the success of deliberate attacks, especially when attacks turn into pursuits. The ability to maintain the momentum of the attack is directly affected by the corps's ability to sustain the force, including the pre-positioning of engineer forces and material. Figure 5-6 shows a corps conducting a deliberate attack and the engineer task organization that supports the inherent corps engineer's tasks.

In the FXXI corps, there has been a doctrinal shift in the CSS community as the Army moves from a supply-based distribution system to a transportation-based distribution system. Inherent in this change is a decrease in the amount of supplies carried forward to pre-positioned points throughout the division AO. This increases the division's dependence on corps assets for the throughput of supplies. This shift in doctrine is termed "velocity management." Velocity management is designed to provide the right resources to the right place, at the right time. This allows the commander to maintain the initiative and momentum of the attack without sacrificing flexibility and surprise. TAV and in-transit "pipeline" visibility of supplies moving from corps to division can be managed and distributed more effectively with technological improvements such as radio frequency tags, the PLS-E, and the MTS. The FXXI corps engineer has the same traditional support requirements as the analog corps engineer to consider the impact of the above changes and adjust the amount and priority of engineer resources that must be allocated. For example, with rapidly moving forces carrying a three-day basic load and relying on throughput supplies from corps, the need to establish and maintain an uninterrupted MSR network becomes extremely critical.

Spoiling Attack

Corps commanders mount spoiling attacks from a defensive position to disrupt an expected enemy attack. A spoiling attack attempts to strike the enemy while he is most vulnerable. Spoiling attacks are conducted like other attacks; they may be hasty, deliberate, or exploitive. Corps engineers support spoiling attacks the same way they support hasty or deliberate attacks, primarily in the mobility area.

Counterattack

The corps commander conducts a counterattack with either reserve forces or lightly committed forward forces. The corps counterattacks after the enemy launches his attack, reveals his main effort, or creates an assailable flank. Counterattacks are conducted much like other attacks, but synchronizing them within the overall defensive framework requires careful timing. Counterattacks can be rehearsed and timing-controlled, and the ground may be traversed and prepared.

Corps engineer support begins with a detailed terrain analysis to determine how to shape the battlefield. The corps engineer plans for counterattacks by ensuring that a proper engineer support force is task-organized with reserve forces. Corps engineers operating in rear areas can have on-order support-type missions to counter-attacking forces. They can also prepare counterattack routes in the corps defensive area. The corps engineer recommends corps ORAs and corps-directed obstacles that ensure clear and protected routes for counter-attacking forces. Corps engineers support counterattacking forces in the same manner as those conducting hasty and deliberate attacks, primarily with mobility assets.

Raid

A raid is a limited-objective attack into enemy territory for a specific purpose other than gaining and holding terrain. The corps commander con ducts raids to destroy key enemy facilities and installations, to capture or free prisoners, or to disrupt enemy C2. Corps engineers support raids based on specific mission requirements, including demolition or breaching support

Feint and Demonstration

A feint is a supporting attack designed to divert the enemy's attention from the main effort. It is usually a shallow, limited-objective attack conducted before or during the main attack by divisions, brigades, or smaller units. A demon stration is a show of force in an area where a decision is not sought. A demonstration threatens attack, but does not make contact. Feints and demonstrations deceive the enemy as to the true intentions of the attacker, pinning him in place, diverting his attention, and allowing decisive action elsewhere. If they unveil an enemy weakness, they may be followed by a hasty or deliberate attack

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routes. Engineer support to the follow-and-support force includes the same mobility, countermobility, and survivability requirements as the exploiting force, along with extensive general engineering work being needed to keep LOC and MSRs open. Corps engineer support to. the follow-and-support force is normally provided by engineer assets already in place. There may also be some time to plan and move other corps engineer units into position to provide needed general engineering support.

The corps engineer has several responsibilities when the corps conducts an exploitation. First, he plans to support the exploitation before the battle begins by providing a flexible corps engineer task organization to the attacking divisions. The exploitation mission is likely to be assigned to the corps follow-and-support force or its reserve. The corps engineer ensures that both of these forces contain enough engineer assets to support future contingencies, including exploitation operations. Second, because the situation is unclear during an exploitation, the corps engineer supports the G2 by assisting in the development of terrain intelligence-gathering requirements pertaining to the area being exploited. He provides information requirements for engineer missions, including locations and sizes of obstacle belts and zones and the location of enemy forces covering them, any friendly or enemy use of scatterable mines that will impact on the mission, the status of specific bridges key to the operation, and the impact of weather and terrain on mobility support. Third, the corps engineer is sensitive to the logistics posture of the engineer force supporting corps exploitation operations. He coordinates closely with the COSCOM, ensuring that engineer logistics requirements are identified and met, especially with fuel and maintenance support.

In the FXXI corps, the corps engineer is much more responsive to the production of intelligence, terrain analysis, and terrain products for the G2. Using FXXI systems such as the MCS-ENG, DTSS, DRS, UAV, and Raptor ICO (when fielded), the corps engineer is capable of producing information and information products in real- or near real-time terms. Using these same systems, the corps engineer will quickly produce and disseminate orders, free-text messages, and digital overlays that will provide current information relative to the location and sizes of obstacle belts, zones, engineer requirements, and friendly use of SCATMINEs.

In comparison to the analog corps engineers' equipment capabilities, the FXXI corps engineer has a much greater resource to accurately locate and identify the enemy forces' obstacles. He does this through the use of tactical reports and imagery produced from systems that include the following:

- Integrated Meteorological System (IMETS).
- UAV.
- JSTARS.
- Comanche.
- LBA.
- DTSS.
- Land Warrior reconnaissance reports.
- FBCF2 links to the MCS-ENG

The current information provided by these systems allows the engineer to understand the enemy's use of SCATMINEs and forecast how they will impact the mission. He also can utilize these systems to receive the status of specific bridges key to the operation and, to observe the impact of weather and terrain on mobility and countermobility operations.

Using both digital and face-to-face coordination, the FXXI corps engineer effects close coordination with the COSCOM through the MCS and a constant review of logistical data stored in the CSSCS database. This coordination includes the exchange of conventional or digital overlays that clearly mark engineer water; fuel; Classes I, IV, and V; and maintenance supply or support points.

PURSUIT

Pursuit is an operation against a retreating enemy force. It normally follows a successful exploitation. The pursuit's object is the destruction of the opposing force that is in the process of disengagement. Pursuit operations require a *direct-pressure force* and normally an *encircling force*. The direct-pressure force prevents enemy disengagement and subsequent reconstitution of the defense, and inflicts maximum casualties by attacking constantly on a wide front. The encircling force's mission is to get to the enemy's rear rapidly, block his escape and, together with the direct-pressure force, complete his destruction (Figure 5-8, page 5-14).

The corps engineer's initial priority is to support both forces with mobility assets. The direct-pressure force requires the capability to conduct decentralized, in-stride breaching operations. The encircling force requires mobility support to get into position, followed by countermobility and survivability support to block the enemy force. Due to the fast pace of pursuit operations, follow-on general engineering support to both pursuit forces is especially critical for timely logistics support to the corps. Due to the nature of the pursuit and its similarities to the exploitation, the corps engineer planning considerations and actions are the same as those of an exploitation.

CORPS OFFENSIVE FORMS OF MANEUVER

The corps normally uses a combination of the basic forms of maneuver--envelopment, turning movement, infiltration, penetration, and frontal attack--when attacking, exploiting, or pursuing. They provide a useful means of conveying the corps commander's scheme of maneuver and what he intends his subordinate units to accomplish. For example, a corps commander may direct one division to effect a penetration while another division envelopes a de-

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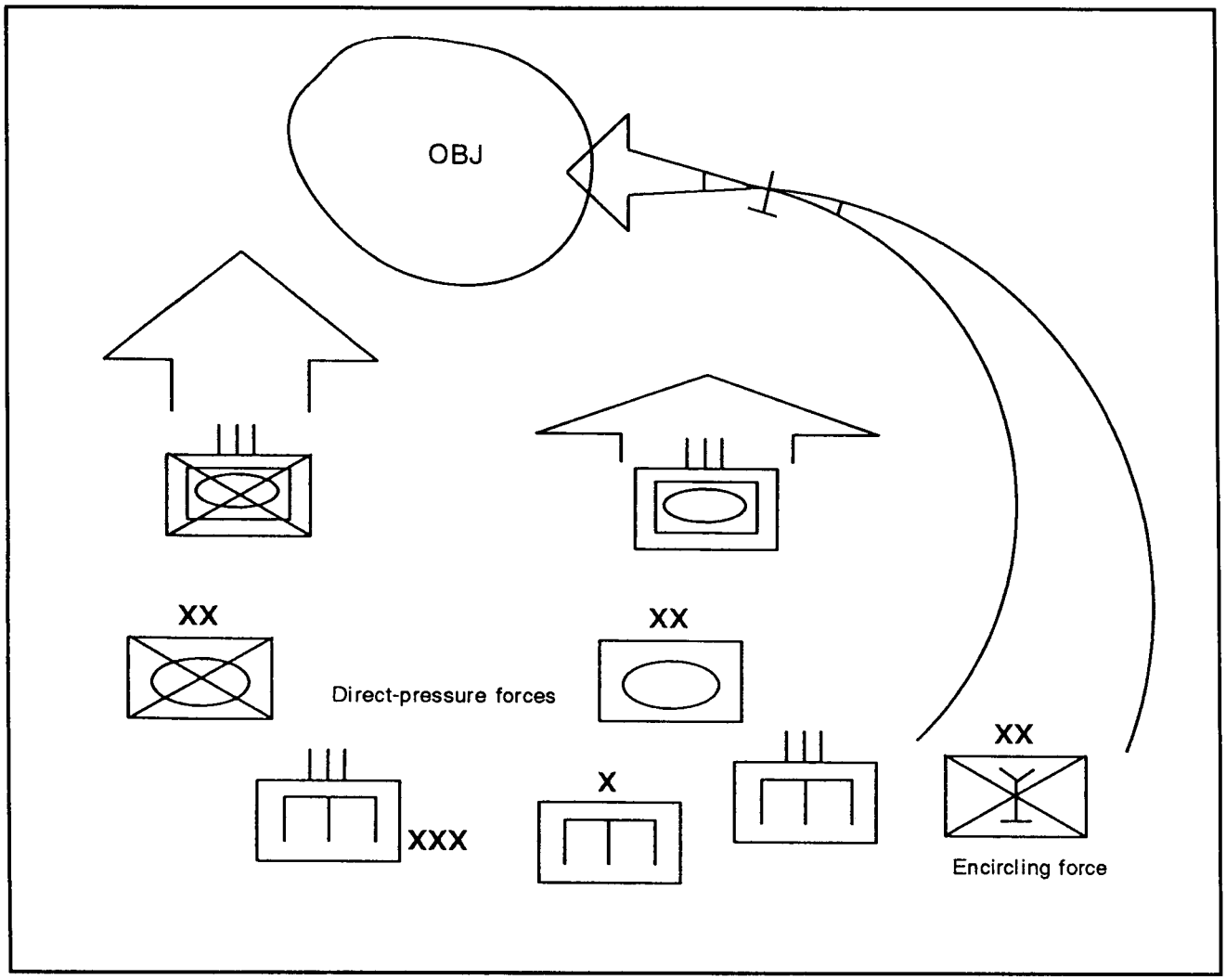

Figure 5-8. Pursuit

fending enemy force. The corps commander determines which form of maneuver to use based on METT-T. He uses the form of maneuver as an expression of intent and overall concept of the operation that gives focus to corps planning. The corps engineer understands each form of maneuver and its implications in developing the scheme of engineer support operations and task organization.

ENVELOPMENT

When attacking, the corps will normally attempt to envelope the enemy force along indirect approaches. This is especially true if the enemy force is of comparable size. To use this form of maneuver, commanders find or create an assailable flank, pitting their strengths against the enemy's weaknesses. The enemy is usually fixed in place from the front by a supporting attack to hold him in position while the main effort passes around the main defense and attacks a flank (Figure 5-9). This is designed to delay or disrupt his reaction to the enveloping force and cause him to commit his reserve prematurely or ineffectively. The main attack's objective can be either force- or terrain-oriented. The main attack may be used to attack and roll up forces in the main defensive belt, second-echelon defense, or reserves. When the objective is terrain-oriented, the main attack is normally focused on securing

key terrain, which cuts the enemy's LOC or escape routes.

In support of envelopments, the corps engineer develops a scheme of engineer operations that focuses on the mobility of the enveloping force and protection of its extended flanks and objectives, along with construction, improvement, and maintenance of MSRs and logistics bases. The divisions and separate brigades that make up the enveloping force normally organize for instride breaching and flank obstacle-emplacement operations. The corps engineer develops a flexible and redundant engineer task organization that augments division and separate brigade breaching, bridging, and obstacle-emplacement capabilities with corps assets. The corps engineer may plan corps obstacle zones and directed obstacles that protect extended flanks and objectives. ORAs may be designated, allowing free movement of enveloping forces. The corps engineer also provides horizontal-construction capability to divisions and separate brigades serving as the enveloping force for extended MSR and logistics base construction, improvement, and maintenance.

The corps engineer develops engineer requirements for corps supporting attacks during the envelopment. Extensive obstacle breaching may be required by the supporting attack divisions or separate brigades. The main effort's

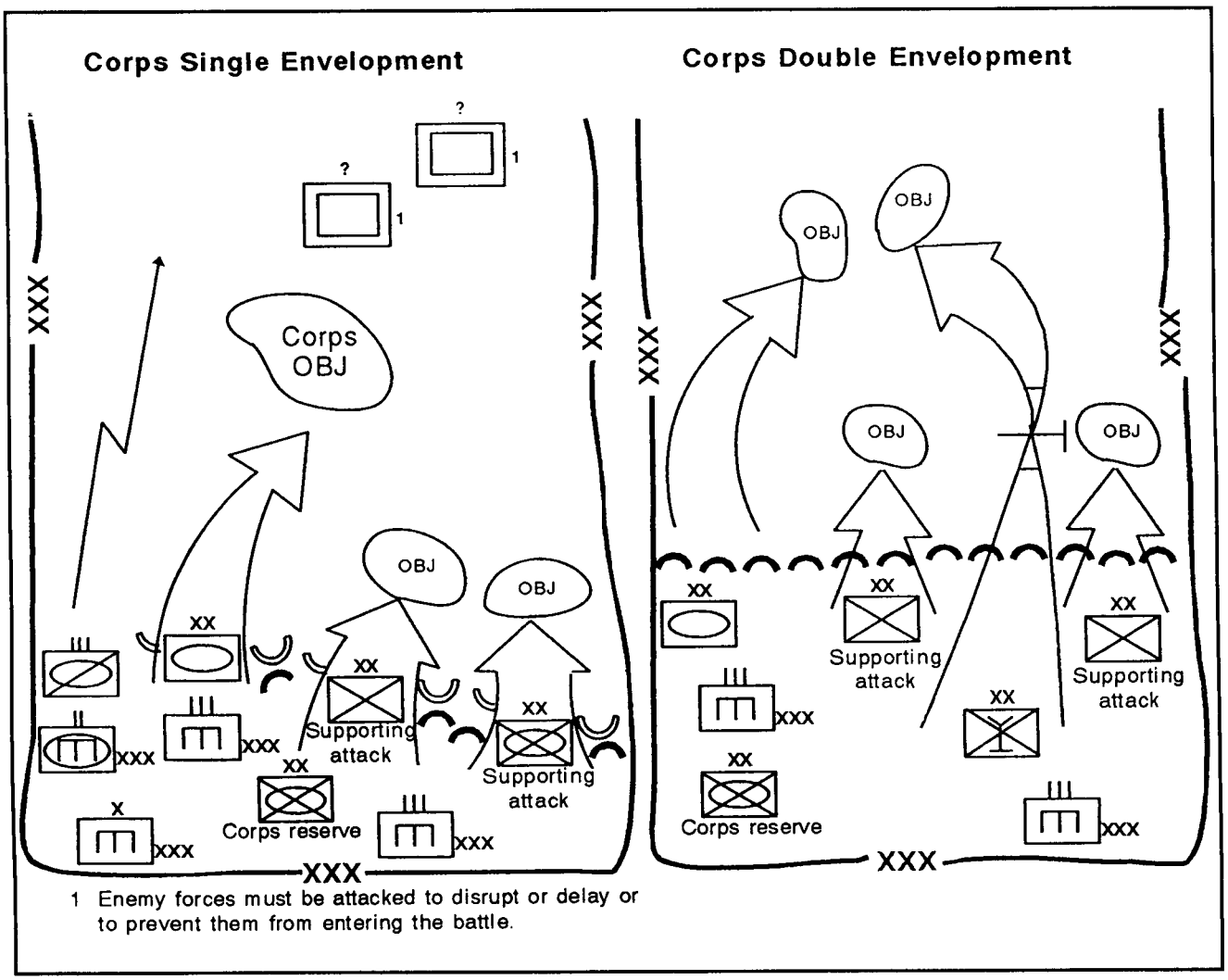

Figure 5-9. Corps single and double envelopment

success may hinge on the ability of the supporting attacks to penetrate the obstacles and cause the enemy to fight in two directions. Corps engineer augmentation to the supporting attack may be limited in scope, forcing the division or separate brigade to rely on organic engineer assets. The corps engineer may have to accept some risk and allocate the minimum essential engineer force needed to augment corps supporting attacks. To minimize this risk, he works closely with the corps G2 on a thorough IPB and obstacle intelligence (OBSTINTEL) collection effort to verify or deny enemy defensive capability facing the supporting attack.

With the advent of the DTSS and its digital links to various national, strategic, and tactical map datum, the FXXI corps engineer can be more responsive in his production of terrain products and the analysis of those products in support of the IPB process. A working FXXI corps engineer will ensure that the G2 airborne and ground intelligence-gathering assets are focused on OBSINTEL collection. Systems such as the UAV, JSTARS, Comanche, LBA, and Quickfix will be instrumental in locating, tracking, identifying, and verifying enemy movements and dispositions facing the supporting attack.

TURNING MOVEMENT

The corps conducts a turning movement to envelop the enemy by striking at areas deep in the rear and at his LOC. The turning movement uses freedom of maneuver to create a decisive point where the enemy is unprepared. It is distinguished from an envelopment primarily by the depth of its objectives and by what the commander intends for it to accomplish. In a turning movement, the corps seeks to avoid the main enemy force, to pass around his defensive belts, and to secure an objective deep in the enemy rear to make the enemy position untenable (Figure 5-10). Due to the large distances involved, a turning movement does not always require a supporting attack to fix the enemy force.

In support of turning movements, the corps engineer develops a scheme of engineer operations similar to an envelopment. It focuses on the mobility of the turning-movement force and protection of its deep extended flanks and objectives, along with construction, improvement, and maintenance of long MSRs and many logistics bases. The divisions and separate brigades that make up the turning-movement force organize for in-stride breaching and flank obstacle-emplacement operations. The corps engineer develops a flexible and redundant engineer task-organization that augments division and separate brigade breaching, bridging, and obstacle-emplacement capabilities with corps assets. The corps engineer may plan corps obstacle zones and directed obstacles that protect extended flanks and deep objectives. ORAs maybe designated, allowing free movement of turning-movement forces. The corps engineer also provides extensive horizontal-construction capability to divisions and separate brigades serving as the turning-movement force for extended MSR and logistics base construction, improvement, and maintenance.

The mobility requirements of a FXXI corps in a turning movement do not differ. However, when fielded with Grizzly and Wolverine, engineer elements of the divisions and separate brigades will be better able to meet the mobility requirements of the turning-movement force. The FXXI corps is able to provide a greater degree of force protection to the turning-movement force by emplacing either air- or ground-delivered SCATMINEs and, if fielded, the Raptor ICO on the objectives and along the flanks of the turning-movements force. Using MCS-ENG, the FXXI engineer can more rapidly plan, coordinate, and disseminate orders and other information critical to the establishment of corps obstacle zones and directed obstacles.

INFILTRATION

Infiltration uses the covert movement of forces through enemy lines to attack positions in the enemy's rear. Corps light infantry units are best suited to conduct an infiltration. The corps commander may use

infiltration in conjunction with other forms of maneuver to a tack lightly defended positions or stronger positions from a flank and rear, to secure key terrain in support of the main effort, or to disrupt enemy rear operations. The size, strength, and composition of infiltration forces will usually be limited to avoid detection until the objective reached. Limited objectives and tasks are also the norm with infiltration forces.

The corps engineer supports infiltration operations with light corps engineer units and equipment as required. Covert obstacle-breaching, obstacle-emplacement, and long-range communications capabilities are packaged with supporting engineer forces. Engineers perform any needed reconnaissance of terrain, obstacles, and enemy engineer capabilities.

With the advent of FBCB2 and the ability to accomplish precision movement, heavy forces may now accomplish some forms of infiltration. The Grizzly, when task-organized with the infiltration forces, has the ability to conduct covert obstacle reduction. FXXI reconnaissance engineers equipped with the FBCB2, and Land Warrior can provide precision information in real or near-real time terms related to terrain, obstacles, and enemy engineer capabilities.

PENETRATION

The corps commander uses penetration when the enemy's flanks are not assailable, to attack through the enemy's principal defensive positions, to break the integrity of the enemy defense, and to defeat the enemy in detail. Penetration is conducted when the enemy force is overextended, a weakness is detected, or an

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exploiting its success by ensuring the mobility of its exploiting divisions. The corps engineer develops a scheme of engineer operations that allows for the rapid development of a lane network within the penetration. The lane network supports both the uninterrupted passage of the corps reserve to subsequent objectives and the logistics flow to forces in the penetration. The corps engineer constitutes an engineer follow-and-support force to expand, upgrade, and maintain the lane network. The corps engineer also ensures the corps reserve has enough engineers to maintain its own mobility as it attacks deep into the enemy's rear area.

NOTE: In the FXXI corps, the corps engineer will maximize using Grizzly (if equipped) to support the obstacle-reduction and-exploitation requirements of the exploiting divisions. Force protection is enhanced through employing such systems as SCATMINEs and Raptor ICO, when equipped. The ability of the FXXI corps engineer to coordinate and mass engineer assets to accommodate the rapid development of lane networks within the penetration of enemy forces is enhanced through the MCS-ENG software function, imbedded in his MCS, and other digital ABCS systems that provide him SA data.

FRONTAL ATTACK

The corps uses a frontal attack to overrun, destroy, or capture a weaker enemy force in position. The frontal attack strikes the enemy across a wide front, over the most direct approaches, or against an enemy weakness or assailable flank. The frontal attack is used when the corps has overwhelming combat power and the enemy is at a clear disadvantage. A corps may employ a frontal attack as part of a supporting attack of a TA envelopment. It is the least desirable form of maneuver because it inherently wastes lives and material unless there is some additional reason for it. Such reasons could be the lack of an assailable flank, critical time constraints, or the desire to deal a severe psychological blow to the enemy. In the frontal attack, the corps strikes along a wide front with two or more divisions abreast attacking in the zone (Figure 5-12, page 5-20). The frontal attack is an appropriate form of maneuver to be used by a fixing division conducting a supporting attack to an envelopment.

The corps engineer supports the frontal attack by providing adequate mobility support across a wide front along multiple axes. The mission's nature may prevent massing overwhelming mobility support from the corps perspective. However, the corps engineer ensures the task-organization allows attacking divisions to mass engineers as required at their level. The corps engineer tries to balance mobility assets with each attacking division to allow the flexibility needed across the front. Follow-and-sup-port corps engineers are decentralized and balanced across the front. They focus on widening lanes, breaching bypassed obstacles, and constructing and improving MSRs. The corps engineer also provides balanced countermobility and survivability assets for each division to establish a decentralized hasty defense on the objective. If the corps's plan is to establish a deliberate defense immediately upon consolidation, the corps engineer allocates needed corps engineer forces to the division at the outset of the frontal attack He also plans for and coordinates with the corps G4 to pre-position and push necessary Class IV obstacle supplies and Class V mines and demolitions to the divisions.

NOTE: For more information on employing emerging engineer mobility systems, see Appendix F, Table F-1. The FXXI digital systems capability to provide battle space SA and show corps a RCP is key in providing the capability to mass forces quickly for an attack.

CORPS OPERATIONS IN DEPTH

The corps engineer thoroughly understands the corps offensive framework to integrate effectively into offensive operations as both the engineer planner and the unit commander throughout the depth of the battlefield. Corps engineers supporting maneuver elements during offensive operations will normally be placed in command relationship tat provides responsive support to the division, separate brigade, or cavalry regiment. Corps engineers will normally weight the main effort but are prepared to shift the main effort rapidly to reinforce success. Maintaining the maneuver element's mobility is the engineer efforts's first priority in offensive operations. Corps engineer units can be task-organized to provide support for river-crossing operations, obstacle breaching, construction of combat trails, MSR maintenance, and other types of support. Corps engineers augment maneuver force engi-

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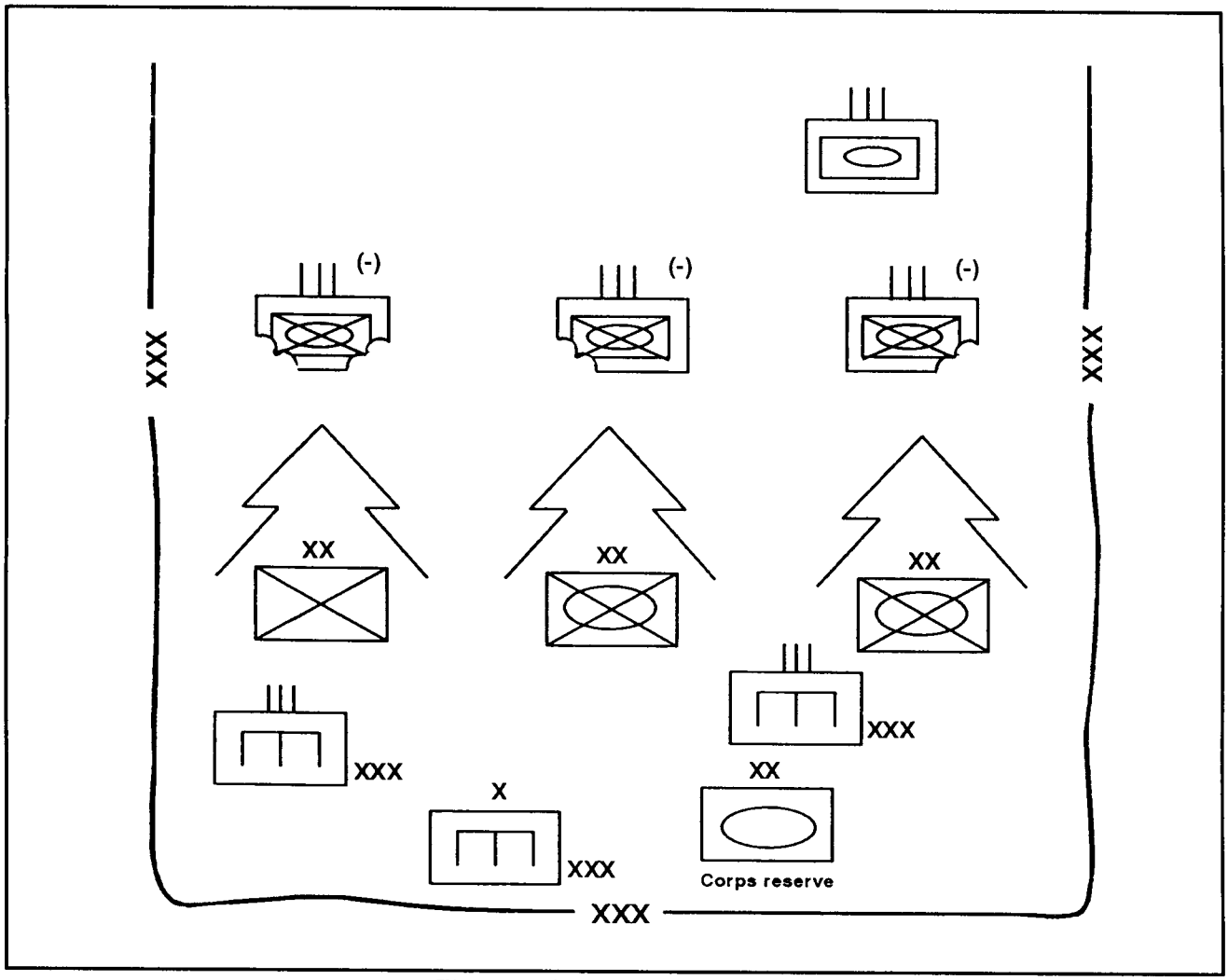

Figure 5-12. Frontal attack

neers to help develop and maintain multiple approach and attack routes. These routes allow forces to enter the fight quickly, building combat power at the point of concentration. During the offense, corps engineers fully support deep, close, rear, reconnaissance and security, and reserve operations simultaneously throughout the entire battlefield.

DEEP OPERATIONS

Corps engineer support to deep offensive operations is primarily accomplished in the areas of topographic engineering, countermobility, and ground maneuver mobility operations. Deep topographic support enhances the commander's ability to see the battlefield and develop courses of actions. Needed terrain analyses include the identification of MSRs, determining the current condition of MSRs and attack routes, the classification of bridges along the attack route, and the status of damaged or destroyed bridges. Various trafficability overlays and other terrain products are also developed. The corps engineer participates in deep countermobility targeting that synchronizes future mobility requirements and assists in the identification of HVTs such as dams, bridges, and other man-made facilities. Bridges in key mobility corridors may intentionally be left intact if their destruction might inhibit future offensive operations. The corps engineer also

CHAPTER 6

Defensive Operations

During the next twenty-four hours I Corps slowly withdrew closer to Seoul. At noon on April 28 (1951) it began occupying Line Lincoln (or Golden). After weeks of engineering work, the line was very strong. It was comprised of a series of deep, interconnected trenches and sandbagged bunkers bristling with machine guns, 57- and 75-mm recoilless rifles, and flamethrowers. It was protected on the north side by half a dozen lines of coiled barbed wire. Beyond and inside the barbed wire were dense fields of antipersonnel mines, booby traps, and "thousands" of gasoline drums (fougasses) filled with napalm and white phosphorus to be exploded by trip wire or remotely activated thermite grenades...

That night--April 28--the enemy made two attempts to crack Line Lincoln (or Golden). The first was mounted by the NKPA 8th Division against the ROK 1st Division sector. Supported by Patton tanks of Hannum's B Company, 73d Tank Battalion, the ROKs yielded a hill, but then counterattacked, killing 1,241 NKPA troops. The second was a CCF attack at Gerry Kelleher's 35th Infantry sector. After Kelleher's men had decisively repulsed the attack, he reported they had inflicted "an estimated 1,000 dead and wounded" casualties on the CCF.

From the book, The Forgotten War, America in Korea 1950-1953, by Clay Blair.

PURPOSE OF THE DEFENSE

The corps conducts defensive operations to defeat enemy attacks and regain the initiative. While military operations focus on maintaining the initiative through offensive action, the defense is an inherent part of any offensive action. The defense is only a temporary state; its purpose is to facilitate an offensive action. The corps may have to defend when it is not able to attack. The defense cannot be purely passive; the corps must seize or create opportunities to attack the enemy throughout its AO. The corps may need to gain time to build combat power or to hold key terrain to facilitate other operations. It may have to defend for the sole purpose of engaging and defeating enemy forces in order to erode their capabilities. During force-projection operations, the corps may have to defend the lodgment area until sufficient friendly forces have been deployed to assume the offense. Counterattacks and spoiling attacks are incorporated into the overall defensive plan. The plan should be flexible enough in terms of its concept and task organization to permit rapid changes. The corps fights a dynamic defense by continually attacking throughout the battle.

The advent of FXXI divisions, systems, and sensors in each of the corps divisions allows commanders the ability to transition to the attack quickly. An expected outcome of advanced information- and intelligence-gathering systems is the ability to locate and track an enemy at extreme distances. Through the use of their intelligence sensors and reconnaissance feeds, real-time and near real-time data are constantly collected and

shared between the digital systems at all staff and command levels. This enables commanders to make continuous assessments of an enemy's strengths and weaknesses.

The early identification of the enemy and his information and C2 systems will also facilitate the targeting and subsequent attack of its HVT and high payoff target (HPT). Repeated deep strikes should create force attrition while additional attack opportunities are planned on a weakened enemy as it moves into the corps's defensive sector. The DTSS and Land Warrior information and the analysis performed on these products will be instrumental in the terrain visualization process. In particular, this analysis will compliment the citing and employment of situational obstacles to shape the battle space and identify likely spoiling or counter-attack locations. The advantage gained from this continuous information flow and the sharing of information is enhanced SA and the development and constant update of the RCP. In a dynamic mobile defense, this translates into more time to prepare and interdict the enemy, strengthen defensive position, build combat power, and position that combat power at the weakest points in the defense. Early knowledge of the enemy's movements allows the corps additional time to plan, organize and, at a minimum, conduct digital rehearsals.

Corps engineers play a vital role in giving the corps a decisive edge while conducting the defense. Engineers understand the charac-

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teristics of defensive operations and how they are applied. They also appreciate how engineer forces and missions integrate into the corps's defensive framework. The engineer-estimate process remains as a base planning tool for integrating into corps defensive plans. While the process remains the same, each step is tailored to the needs for defensive planning.

CHARACTERISTICS OF DEFENSIVE OPERATIONS

The corps defense serves to defeat the attacking enemy and regain the initiative. It is an active, not passive, operation. It is characterized by flexibility and violence, attacking the enemy throughout the depth of his formations. Corps defensive operations include five distinct characteristics: preparation, security, disruption, mass and concentration of forces, and flexibility.

PREPARATION

Defensive operations have a distinct preparation phase that is vital to the corps's success. The defender arrives on the battlefield first and, as time allows, is afforded the opportunity to choose his ground in order to capitalize on the advantage of fighting from selected and prepared positions, and to set the conditions for the battle. The corps prepares for the defense by positioning forces, making use of and improving terrain, developing and war-gaming plans, organizing the force for movement and support, rehearsing, and conducting surveillance and reconnaissance forward of the defended area. During the course of the battle, the corps looks for opportunities to wrest the initiative from the attacker. The corps commander prepares for this by identifying counterattack forces and rehearsing counterattack plans for eventual transition to the offense.

Corps engineer functions and forces are a critical component in setting the conditions for combat and giving the corps an edge against an attacker. Corps engineers play a major role in defensive preparations, depending largely on their ability to conduct integrated planning with the corps staff and parallel planning with the corps engineer brigade staff. The corps engineer staff uses engineer channels to disseminate the information and intent needed to foster early defensive planning at all levels. Corps-level engineer planning provides a centralized focus for the defense while allowing decentralized execution. The corps engineer staff uses the scheme of engineer operations, obstacle-emplacement capability and control, survivability guidance, and counterattack mobility requirements to focus the corps's subordinate unit engineer efforts. The corps engineer considers the full range of engineer requirements for the total defensive framework: deep, security, close (MBA), rear, and reserve operations. Each element is considered during the engineer mission analysis and accounted for in the corps scheme of engineer operations. The corps engineer resources subordinates through task organization and the prioritization of Class IV obstacle materials and Class V mines and demolitions. This allows subordinates to anticipate limitations on their capabilities, to prioritize support, and to identify engineer asset shortfalls. Topographic engineers help prepare for defensive operations with detailed terrain-analysis products. Combat engineers perform engineer reconnaissance and intelligence collection, support the siting and preparation of fortifications and obstacles that exploit the defender's advantages, and rehearse breaching drills with counterattack forces. Wheeled combat engineer battalions, combat heavy engineer battalions, and CSE companies provide general engineering support by constructing, upgrading, and maintaining MSRs and logistics bases throughout the corps's defensive AO.

The FXXI engineer takes on new importance with his ability to produce terrain products and analysis having real- or near-real-time importance to defensive preparations. The

local production of products will facilitate the selection of defensive ground, COA development, and the conduct of reconnaissance and surveillance missions forward of the defended area. The corps engineer is able, via local area network (LAN) or the tactical Internet (TI), to acquire information stored in other ABCS databases or on staff home pages that is essential to staff planning and COA analysis/development. His ready access to digital information compliments and often shortens the integrated staff planning process and enables parallel planning. For example, as staff elements conduct their planning and COA development, a digital sharing of ideas and information can be accomplished both horizontally and vertically. Instantaneous sharing of ideas enables continuous cross talk, the identification of problems, and the early resolution of problems as identified. In addition, these systems expedite the dissemination of a WARNORD, intelligence data, and situational overlays that enable the divisions to initiate early planning.

Through operational interfaces between the engineer's MCS, G3's MCS, and G4's CSSCS, the FXXI corps engineer is better able to determine resourcing requirements, personnel and equipment shortfalls, and the impact these limitations will have on engineer support operations. The ability to acquire current and timely information facilitates resourcing, prioritizing Class IV and V requirements, and proposing more accurate task-organizations recommendations to the G3. Engineer reconnaissance and intelligence gathering operations will be enabled through use of the DRS and Land Warrior when the system is fielded.

SECURITY

Defending forces provide security to conserve combat power for use elsewhere. The purpose

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of security in the defense is to coordinate and synchronize the defense, to provide early warning, and to begin disrupting the integrity of the enemy attack early and continuously. The corps provides defensive security through force-protection measures, deception, and physical means in the defensive area. The corps normally provides a security area with a designated covering force.

Corps engineers assist in the defense's security in several areas. Corps engineer battalions attached to covering force units emplace situational obstacles in the face of the enemy and conduct timely terrain and enemy reconnaissances. Corps engineers operating in the MBA emplace tactical obstacles that fix, turn, disrupt, or block enemy formations. They also provide force protection during survivability operations for corps C2, artillery, air defense, and logistics facilities. Corps engineers support deceptions operations as required.

NOTE: If equipped with the Raptor ICO, the FXXI corps can use it to monitor enemy activity and trigger it, on demand, to accomplish the desired obstacle effects.

DISRUPTION

Corps defensive forces disrupt the enemy attack throughout the depth of his formations by—

- Destroying forces.
- Spoiling the timing or synchronization of his attack.
- Denying his freedom to maneuver.
- Misleading enemy reconnaissance.
- Breaking up formations.
- Interrupting fire support, logistics support, and C2.
- Seizing the initiative.

The corps defense includes a focused attempt to disrupt the enemy effort through deep, security, and deception operations. The attacker is never allowed to get set. He is hit with spoiling attacks before he can focus his combat power, and he is counterattacked before he can consolidate any gains.

Corps engineers aid in the disruption of the enemy attack throughout the depth of the battlefield. The corps engineer and his staff work closely with the corps staff to ensure that engineer functions are integrated into deep operations. For example, the corps engineer staff nominates deep targets that directly attack the enemy's engineer capability to conduct mobility operations such as bridging and breaching assets. Based on terrain analysis and engineer intelligence, the staff also nominates deep targets for destruction or denial and designs obstacle systems that fix or disrupt enemy formations.

NOTE: In the FXXI corps, the use of such systems as UAV, JSTARS, LBA, and Comanche will eliminate second guessing related to enemy engineer deep HPT and HVT. For example, the imagery gathered through these sources, when compared to other engineer intelligence data, can confirm exact enemy locations. In turn, the HPT and HVT can be targeted and attacked by the corps's long-range artillery, attack aviation, CAS, or a mix of all three.

The staff ensures that engineer aspects of deep and MBA operations are mutually supportive. Corps engineers provide the security force with the countermobility means needed to disrupt the enemy's attack early and the mobility means needed to fight a fluid battle. Obstacles are used in disruptive deception efforts in the MBA. This causes the enemy to commit combat power prematurely or against a strength perceived as a weakness. Corps engineer forces provide the mobility required of corps counterattacking forces that will complete the defeat of the enemy force and regain the initiative. Corps engineer units also provide survivability support to defending forces. This support allows the massing of effects of lethal firepower to disrupt an attack.

MASS AND CONCENTRATION

The corps commander will concentrate his forces swiftly and mass the effects of overwhelming combat power where he chooses. He shifts that mass repeatedly with his point of main effort during the period of the enemy attack. The corps concentrates forces to exploit or create an enemy weakness. The corps commander may be willing to economize and accept risk in some areas to create the effects required. Economy-of-force operations or de-

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ception may be major factors in the corps's defensive plan. The corps retains and, when necessary, reconstitutes a reserve.

Corps engineers support the massing of forces and the concentration of effects through mobility. This allows rapid movement of forces and survivability to maximize protection of both fighting and support systems. Engineers support corps deception operations through a variety of tactical engineering missions or by providing forces. Corps engineers contribute significantly to economy-of-force operations by emplacing dense obstacle zones, enhancing survivability of massed firepower and C2, and constructing strong points. Engineers also provide mobility for the rapid movement of corps counterattack forces and reserves to allow the corps to take offensive action and exploit a broken enemy attack.

NOTE: When fielded, Raptor ICO and Hornet PIP can be emplaced as unattended sensors to provide early warning. This frees forces that would normally be dedicated to an economy-of-force role. Improved mobility systems such as Grizzly, when fielded, will significantly enable the mobility of a counter attack and the reserve forces.

FLEXIBILITY

Corps defensive plans are flexible to allow agile execution. Corps defensive operations counter the enemy's blows, seize the initiative from the enemy force, and set the conditions for regaining the initiative. Agility requires the corps staff to read the battle, plan branches and sequels, organize the battlefield in depth, retain reserves, plan counterattacks, and have the ability to shift the main effort.

Corps engineers support the corps's flexibility and agility with all available units. Corps topographic engineers contribute to the corps commander's ability to see and read the battle by providing timely terrain analysis and special topographic products. Corps combat engineers provide tactical mobility to counterattack and reserve forces. Corps construction engineer forces provide general engineering that allows the corps commander to react quickly by building and maintaining routes that allow rapid shifts of combat and support forces. They also establish forward logistics bases. Engineer success is directly dependent on the ability of all engineer staffs within the corps to anticipate requirements and take actions to provide timely engineer support to the corps.

DEFENSIVE PATTERNS

Corps defensive operations generally take one of two patterns: a mobile defense or an area defense. The fundamental difference between these patterns is their focus-and-defeat mechanism. The scheme of engineer operations to support corps defensive operations is tailored to the type of defense and its focus-and-defeat mechanism. Mobile defenses focus on the destruction of the attacking force by permitting the enemy to advance into a position that exposes him to counterattack by a mobile reserve force. Area defenses focus on the retention of terrain by absorbing the enemy in an interlocking series of positions and destroying him largely by fires. Both forms of the defense employ static and dynamic elements. Defending corps commanders combine both patterns, using static elements to delay, canalize, and ultimately halt the attacker and using dynamic elements (spoiling attacks and counterattacks) to strike and destroy enemy forces. The balance among these elements depends on METT-T but generally involves a combination of both. Regardless of the pattern selected, success depends on the employment of both static and dynamic elements to defeat an attacking enemy.

MOBILE DEFENSE

The focus of the corps's mobile defense is the destruction of the enemy attacker. The

mobile defense is organized to permit the enemy to advance into a position that exposes him to counterattack and envelopment by a mobile striking force. Therefore, the mobile defense trades space for time to achieve a decisive advantage against the enemy. The defeat mechanism is a large, mobile striking force that has combat power and mobility greater than the targeted enemy force. Corps defenders place

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minimum forces forward, forming powerful forces with which to strike the enemy at his most vulnerable time and place.

NOTE: The FXXI corps with its enhanced weapons and digital systems is ideally suited to execute a mobile defense. The corps's agility and flexibility are vastly improved with its ability to find, track, and conduct precision maneuver and to attack an enemy at extended ranges. These same capabilities extend to those forces positioned forward in the MBA.

Corps engineer forces support the mobile defense with mobility assets, decentralized engineer command relationships, and dedicated engineer forces committed to the maneuver mobile striking force. The mobility of the defending force is key to the success of a mobile defense. Engineers provide rapid breaching and mobility assistance through all encountered obstacles. A decentralized engineer force distributed among maneuver elements in command relationships allows maneuver commanders the flexibility necessary to execute a mobile defense. The maneuver force reserve normally has a dedicated engineer force assigned to it in a command relationship to ensure synchronized and responsive support. While engineer forces are not held in reserve, engineer support to the mobile striking force is a critical mission. The successful mobile defense depends on the synchronized integration of maneuver, fires, and obstacles to seize the initiative from the attacker within the defended area. Figure 6-1 shows an example of the framework of a corps mobile defense.

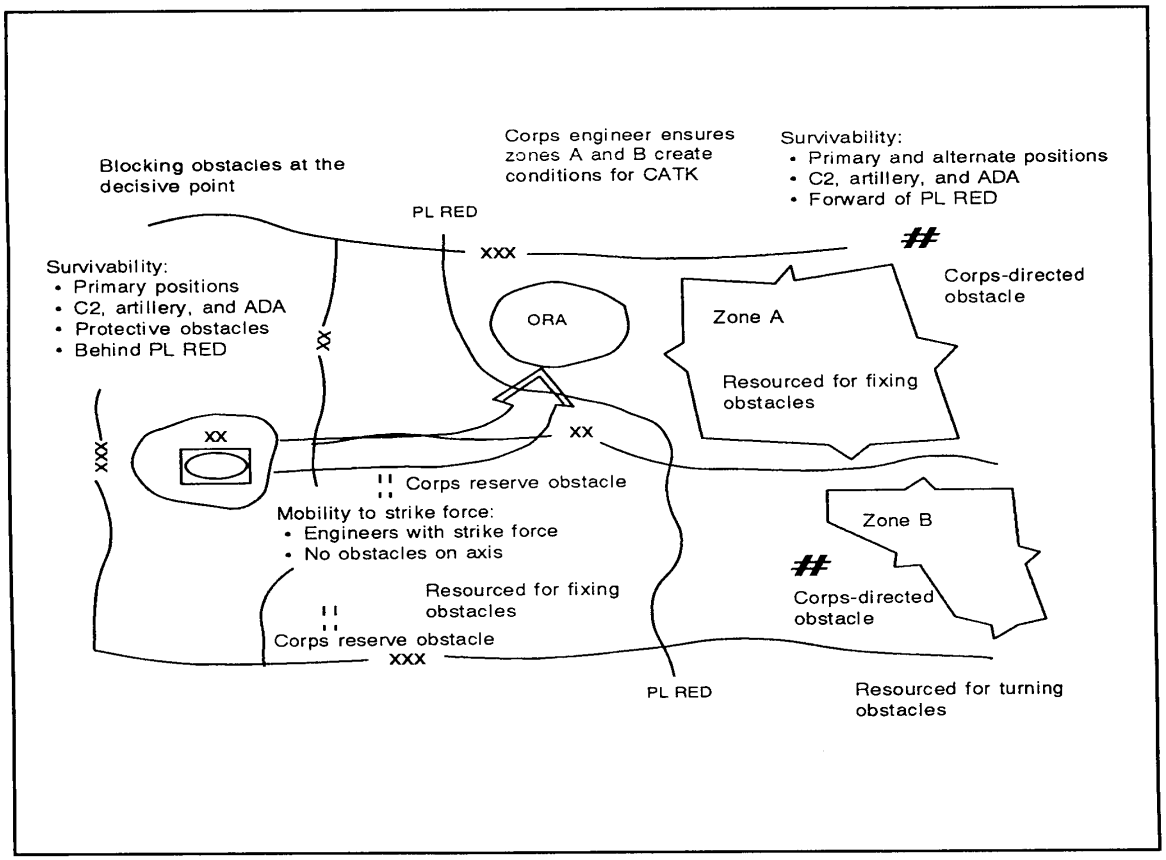

Figure 6-1. Mobile-defense framework

Countermobility support to the mobile defense concentrates on using obstacles to attack the enemy's ability to maneuver and preserves the mobility of the friendly force. Obstacle planning during the mobile defense is closely linked to the enemy's most probable maneuver course of action rather than terrain. Corps terrain analysis and topographic products assist the obstacle planning effort by identifying likely obstacle-emplacement areas used for attacking the enemy's maneuver in a way that supports his destruction by friendly counterattack. Corps obstacle planning during the mobile defense is usually more restrictive than permissive and reduces the flexibility of the divisions.

NOTE: The restrictions imposed are necessary and preserve the division's freedom of maneuver. However, the corps engineer can provide digital overlays that will facilitate the division's maneuver through the identification of obstacles and all associated restrictions.

Directed corps obstacle zones, reserve demolition obstacles, and ORAs will be the norm. This serves to mass division obstacle effort at critical areas and to preserve the mobility of the corps counterattack force into the MBA. Survivability effort trades space for time to create an enemy weakness to exploit by counterattack. To create the conditions for a counterattack, the divisions fight the depth of their sectors. Corps engineers provide survivability support to the divisions primarily by constructing alternate and supplementary fighting positions in depth. The nature of the mobile defense fight reduces the need for protective obstacles throughout the defense. Protective obstacle effort is concentrated in the final subsequent positions where the penetration must be blunted to allow counterattack to support the mobility of the mobile striking force. The staff first delineates obstacle control measures to ensure division obstacle efforts do not limit the mobile striking force's freedom to maneuver. Then, they ensure that the mobile striking force has the necessary dedicated engineer support to maintain its mobility during the counterattack. It must be able to reduce enemy or friendly obstacles found in its path. The counterattack cannot be stalled by lack of mobility. The corps engineer staff weighs the trade-offs between dedicating corps engineer forces to the mobile striking force or the obstacle emplacement and survivability requirements in the MBA. General engineering support to corps logistics agencies focuses on constructing and maintaining numerous MSRs and logistics bases that shift continuously during the mobile defensive fight.

Countermobility support in the FXXI corps extends to the use of systems like Raptor ICO and Hornet PIP and SCATMINE systems to create situational obstacles. Obstacle planning in the FXXI corps is augmented and supported by a continuous feed of real- or near real-time information gathered from a number of digital databases, digital or manual interfaces with other staff cells, and tactical reports provided by subordinate engineer units.

AREA DEFENSE

The corps commander conducts an area defense to deny the enemy access to terrain or facilities for a specified time. The corps may conduct an area defense as part of a larger theater mobile defense. The bulk of defending forces deploys to retain ground, using a defeat mechanism that is a combination of defensive positions with interlocking fires and a small mobile reserve to defeat local penetrations. The area defense is organized to absorb the enemy into an interlocked series of positions from which he can be destroyed. A security area or covering force is also part of an area defense. METT-T drives the tasks to be done and determines priority. The maximum use of obstacles, flame weapons, engagement areas, and control and distribution of fires is key to successful area defense. The area defense does not promise outright destruction of the attacker; and it may require other simultaneous or subsequent operations to achieve a decisive defeat

of the enemy. Figure 6-2 shows an example of the framework of a corps area defense.

Corps engineer forces support the area defense based on detailed corps plans and synchronization of all operational and tactical warfare components. Timely corps topographic and terrain-analysis products assist in the identification of key and decisive terrain. They also play a major role in organizing an area defense and become the focus of obstacle emplacement and survivability effort. Preparation of the area defense is important and engineer effort is extensive, particularly in that area designated as the corps's main effort. Retaining centralized control of corps engineer units and their resources is the most efficient method of preparing the area defense, so engineers are generally employed under their own commanders in a support relationship to maneuver com-

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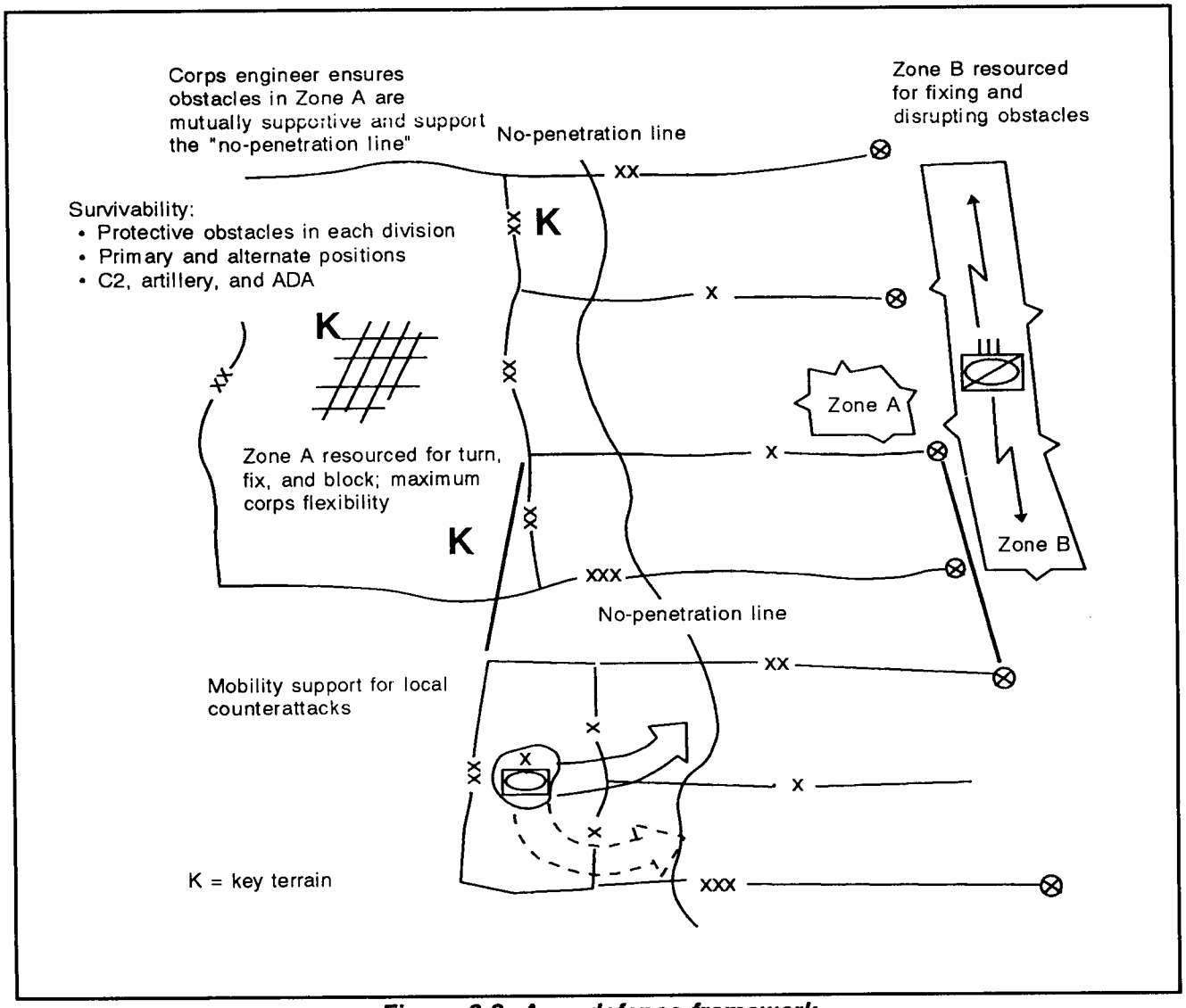

Figure 6-2 Area defense framework

manders. Corps obstacle planning uses minimum obstacle control measures to give maximum flexibility to the divisions while still focusing tactical obstacle effort around the retention of terrain. Engineer units in support of corps security forces assist in the disruption of attacking formations by emplacing planned and situational obstacles in the covering-force area. Other corps engineer forces help shape the battlefield to maximize the effects of friendly fires and enhance the survivability of friendly forces throughout the depth of the corps area. Survivability effort enables divisions to concentrate firepower from fixed positions. The corps engineer staff is sensitive to the division's increased fortification needs in a corps area defense. The increased requirement for survivability also entails heavier employment of protective obstacles to break the attacker's assault. This increased need for division primary, alternate, and supplementary fighting positions and protective obstacles requires more corps engineers to support the divisions. Once the battle is joined, a minimal number of corps engineers remain with committed forces in a command relationship. This allows for rapid repair of obstacles and fighting positions and provides mobility support for lo-

cal counterattacks. The bulk of the corps engineer force withdraws to continue to work on defenses in depth. General engineering support to corps logistics agencies focuses on constructing, maintaining, and protecting critical MSRs and logistics bases that are normally limited in number due to terrain constraints during the area defensive fight.

OPERATIONS IN DEPTH

In the defense, the corps seeks to maximize its firepower, mobility, and shock effect to defeat the enemy's attack and transition early to the offense. Regardless of whether the mission calls for a mobile or area defense, the corps uses the following six elements of the defensive framework to plan the synchronization of its simultaneous deep, close, and rear operations as one battle:

- Deep operations in the area well beyond the forward line of own troops (FLOT).
- Security-force operations forward and to the flanks of the defending forces.
- Defensive operations in an MBA.
- Reserve operations in support of the main defensive effort.
- Rear operations to retain freedom of action in the rear area.
- Deception operations to reinforce the enemy's perception of his success and to delude him as to the true location and intended use of the corps's reserve forces.

DEEP OPERATIONS

Corps engineer operations in support of the deep defensive fight emphasize topographic support, engineer reconnaissance and countermobility. The corps topographic company supports the corps IPB process with terrain analyses and special products. This support is used to plan deep fires and deep obstacles in and beyond the corps covering-force area. The corps engineer and his staff at the corps main CP provide nominations for deep targeting (including corps-directed obstacles zones using air-and artillery-delivered scatterable mines and bridge destruction) along major enemy avenues of approach. Emplaced deep obstacles are covered by aircraft or artillery fire for full effectiveness. The corps engineer staff, along with the G3, G2, and other staff officers, identifies obstacle zones intent (normally fix or disrupt), obstacle locations, covering-fire support, and timing in relation to execution criteria and decision points.

The two primary differences in deep operations performed in the FXXI corps and division are the tools used to conduct planning, coordination, synchronization, integration, and execution and the increased role-play of the corps and division engineer. The emphasis remains on terrain and its impacts on reconnaissance operations. However, these operations are also focused on blinding the enemy's reconnaissance and surveillance capabilities as well as its C2 and information systems. In the FXXI corps, the corps engineer, using intelligence data generated from ASAS-RWS, UAV, JSTARS, and other air and spaceborne platforms, can obtain a highly accurate picture of the enemy's movements and dispositions. Using the DTSS, the FXXI corps and division engineer will provide terrain products and an analysis that will aid terrain visualization and the effectiveness of reconnaissance and surveillance missions. With improved engineer munitions and mobility systems, the corps engineer is now a key and integral member of the deep operations planning cell. He plays a key role in the planning, coordination, and integration of these munitions and systems in deep-strike operations.

SECURITY OPERATIONS

The corps engineer anticipates the very decentralized execution of the screen, cover, or guard mission by allowing maximum flexibility to employ tactical obstacles by the cavalry regiment through the use of corps-directed obstacle zones across the corps front or along a flank (see

Figure 6-3 and Figure 6-4, page 6-10). The obstacle zone rear limit is normally a battle handover line (BHL). The security-force engineer has obstacle responsibility forward of the BHL. The MBA engineer has obstacle employment responsibility up the BHL. The MBA engineer is precluded from employing obstacles forward of the BHL. The corps engineer ensures effective coordination between the security force and MBA engineers which supports battle handoff and passage of the security force. The corps engineer considers Hornet PIP, scatterable mines to assist the cavalry regiment's disengagement. The regiment can be reinforced with modular pack mine systems (MOPMS), the air or ground Volcano, and artillery-delivered mines through coordination with the corps fire-support coordination officer (FSCOORD). Mobility and hasty survivability are critical to the cavalry regiment. Assault bridging augmentation may be required from the corps. Marking lanes

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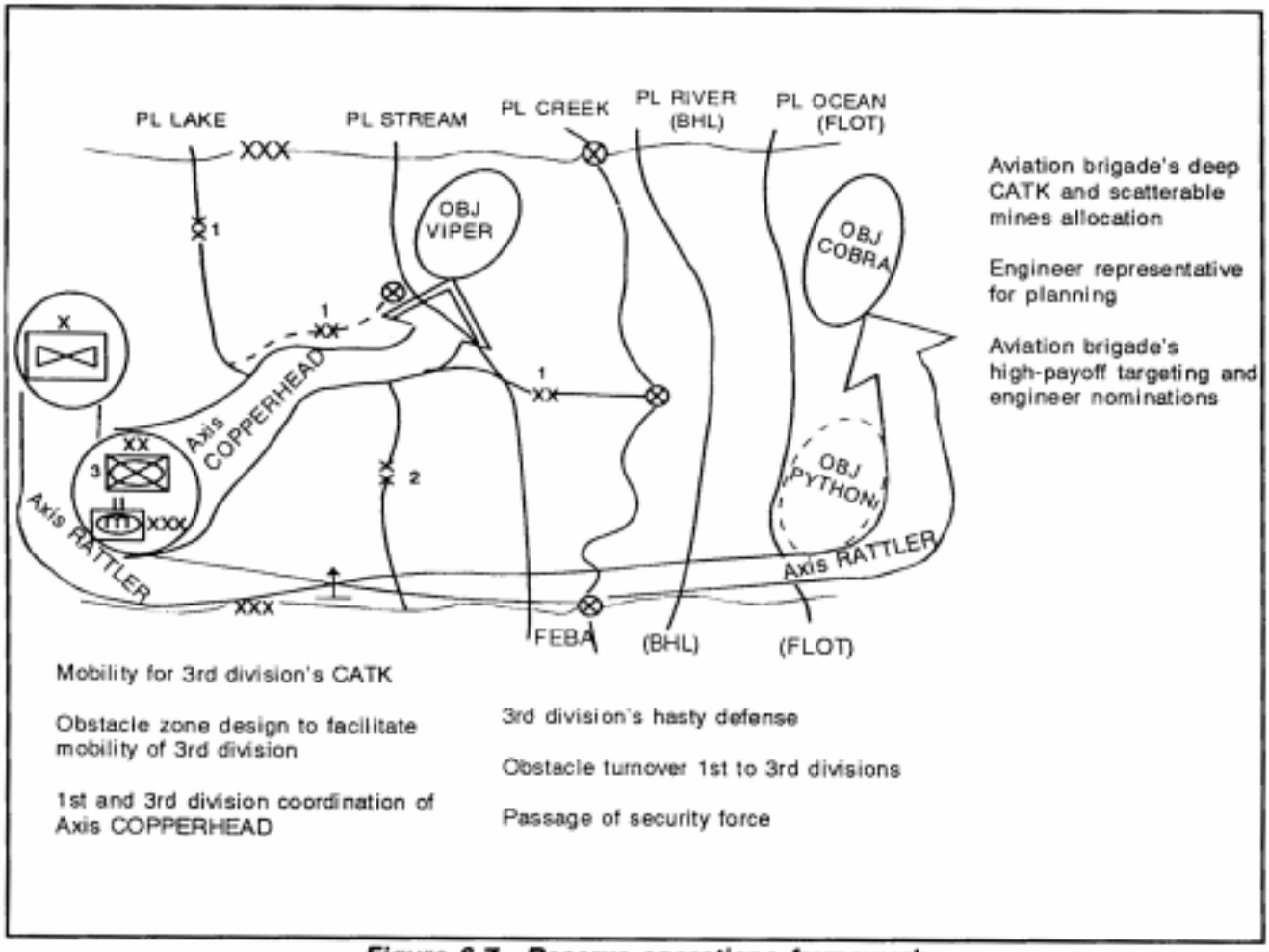

Figure 6-7. Reserve-operations framework

the point of commitment. These corps engineer units are normally placed in a command relationship to the reserve force to allow immediate responsiveness when committed. These engineer forces are not considered in reserve but are fully engaged in synchronizing their support to the reserve force through timely staff integration and combined arms rehearsals. The corps engineer force remains with the reserve force when it becomes the corps main effort, avoiding confusing task-organization changes during the heat of battle.

REAR OPERATIONS

Corps engineer support to rear operations focuses on survivability and general engineering for units in the corps rear area and on maintaining mobility along corps LOC (see Figures 6-8 and 6-9, pages 6-14 and 6-15). Mobility and survivability support to corps rear-area base clusters is normally limited to C2 nodes, key logistics facilities, EW nodes, ADA sites, and corps aviation units and facilities. Engineer support to survivability includes the digging in of high-value systems and supplies, the construction of field fortifications, assistance in camouflage, the digging of sumps for thorough decontamination operations, and assistance to deception operations. The keys to successful employment of general engineering in the corps rear area are prioritization for engineer effort by the corps commander (in conjunction with his G3/G4), anticipation of requirements through all phases of the battle, and task organization of engineer forces in the corps rear

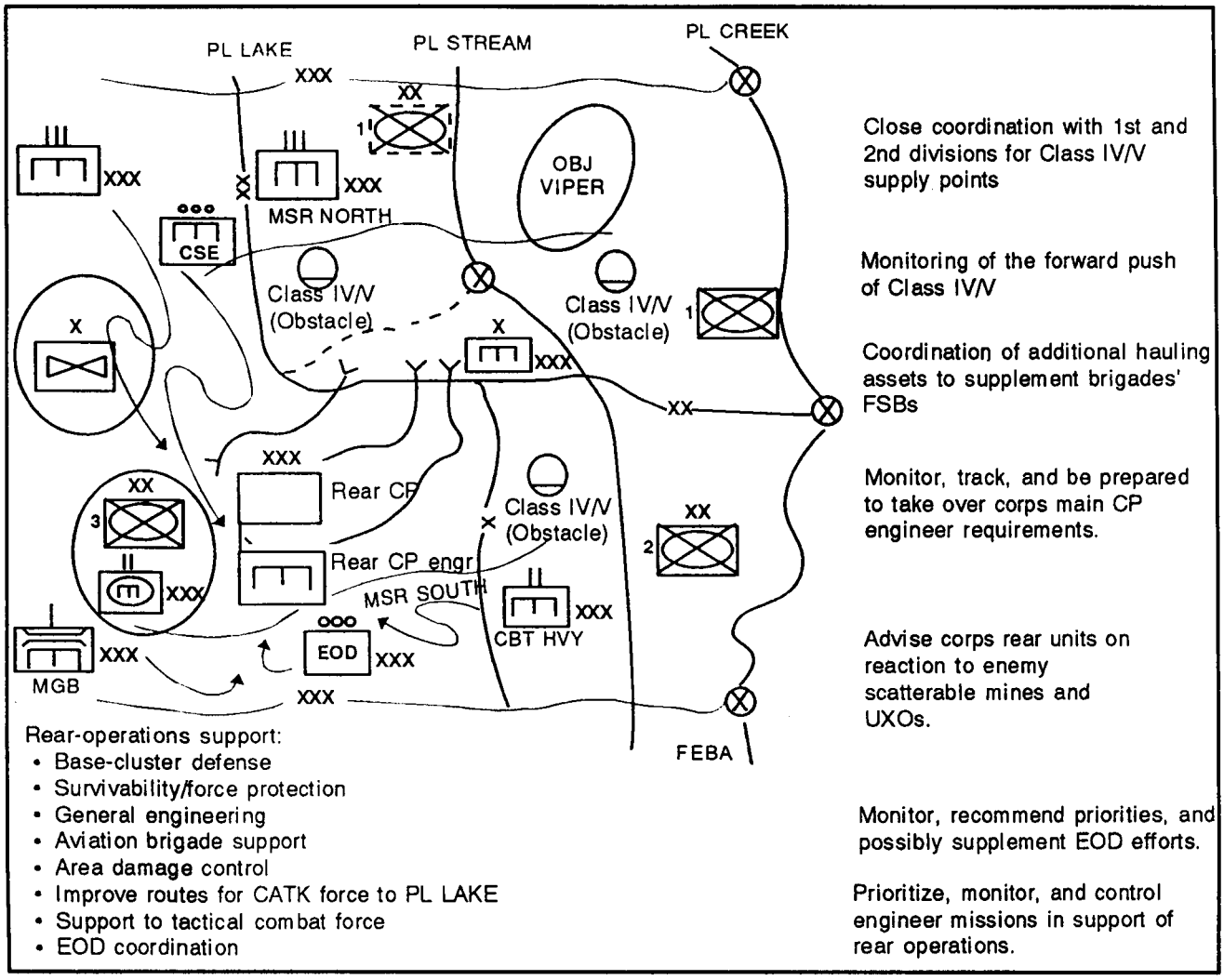

Figure 6-8. Rear-operations engineer laydown

area that clearly define command or support relationships. Defensive operations lend themselves particularly well to general-engineering support provided on an area basis. When this method is employed, corps engineer groups may be used to direct general-engineering effort in the corps rear area Limited countermobility support may be provided by emplacing protective obstacles that protect key C2 and logistics facilities as well as corps flanks. A serious threat to the corps rear area may require the establishment of a TCF using corps engineer units when properly trained and augmented with fire-support, logistics, medical, transportation, and C2 assets. The use of engineers as a TCF must be carefully evaluated by the corps commander as the reduction of critical support could jeopardize other corp missions.

NOTE: The FXXI corps engineer may task-organize corps engineer units with Hornet PIP as a protective obstacle. This munition along with SCATMINE systems will be used to protect C2, logistics facilities, and corps flanks.

DECEPTION OPERATIONS

Observed engineer activity, since it is a scarce battlefield asset, is effective in painting a false picture. Dummy obstacles, phony minefields, shallow ditches, and weapon positions can all be used to deceive and aid force survivability. Most deception operations will be guarded information with only selected corps personnel knowing the full scale of the deception operation. In order to ensure OPSEC as it relates to the deception plan, corps

given mission-type orders that do not reveal the direct participation in a deception operation.

NOTE: The use of MCS/MCS-ENG will enhance the corps and division engineers' deception planning and the dissemination of guarded information. For example, these systems can be used to conduct coordination and continue on-going defensive planning while voice systems are used to compliment on-going deception operations.

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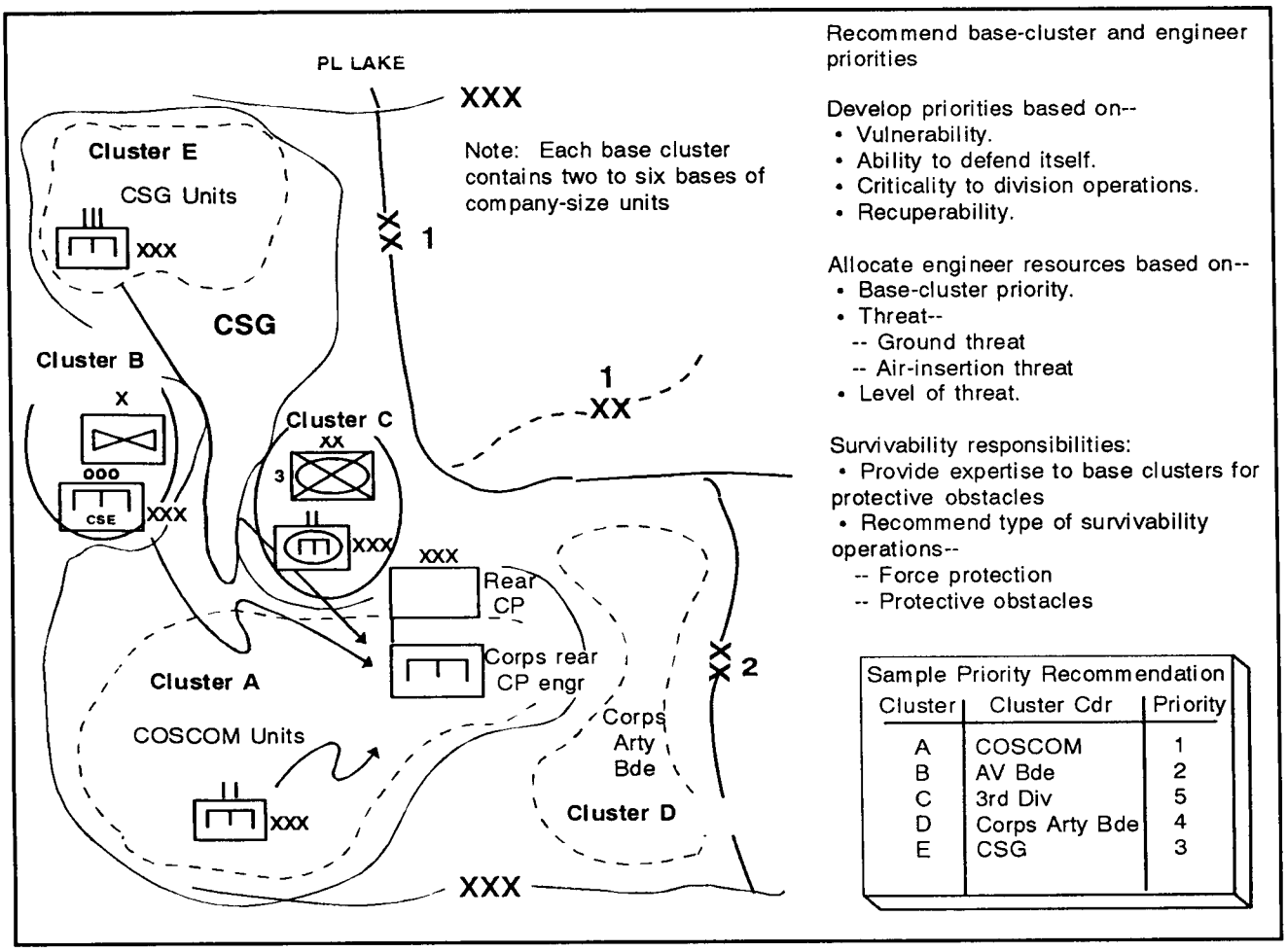

Figure 6-9. Rear-operations base-cluster engineer laydown

ENGINEER DEFENSIVE PLANNING

The engineer-estimate process provides the planning framework for the corps engineer to integrate into the corps command-estimate process (see Figure 6-10, page 6-16). It provides a systematic procedure for developing the engineer task organization and scheme of engineer operations to support the corps in defensive operations. The basic engineer-estimate process is found in Appendix B.

In the FXXI corps, digital systems speed the engineer-estimate process, facilitate task organization, enable the development of engineer schemes of maneuver, and enhance monitoring and tracking of engineer actions/activities. For example, the corps engineer and his staff will use data stored in the MCS-ENG, ASAS-RWS, CSSCS, and DTSS databases and the tactical reports received via voice and digital systems to conduct his engineer estimate. As orders, terrain analysis, and preliminary schemes of engineer maneuver are developed by the engineer staff, they will be shared electronically with the staff elements at corps and the division. This promotes early planning and a collaborative exchange and discussion of viable plans and COA using real- or near real-time information. In particular, the ability to collaboratively develop and share obstacle information is enhanced through an exchange of digital overlays and free text messages that clearly define obstacle zones and intents. Once the engineer estimate is complete and planning finalized, the division engineer and his staff have the ability to

monitor and track the on-going emplacement of these obstacles. This is accomplished through the exchange of digital overlays, tactical reports, and free text messages submitted through the FBCB2 and MCS-ENG as obstacles are emplaced at the maneuver level.

MISSION RECEIPT

The engineer-estimate and defensive-planning process begin with the corps engineer receiving his mission. This mission is extracted from the TA, JTF, or other higher headquarters OPORD; the engineer annex; graphics; and the corps WARNORD. Based on the identified mission, the corps engineer staff (the engineer brigade commander, the brigade staff, and the SES) participates in the corps mission analysis process by developing facts and assumptions. Working simultaneously with the G2 and G3, the corps engineer staff conducts an EBA. The EBA consists of analyzing the terrain and assessing the enemy and friendly engineer capabilities. A thorough, in-depth understanding of the commander's intent leads to a corps defensive obstacle plan that not only attacks the enemy where desired, but also assists counter-attacks and facilitates future operations.

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Mission

Corps's mission and theater/JTF commander's intent
Corps's allocation and plan for Class IV/V supplies
Corps's obstacle restrictions
Theater/JTF requirements for future mobility impacting on corps

IPB and EBA

Terrain:
- No-go terrain and obstacle effort
- Key or decisive terrain to focus countermobility effort

Enemy engineer capability and missions:
- Enemy mobility capability at regimental through corps
- Enemy corps and division countermobility capability for flank protection and transition to hasty defense

Friendly engineer capability:
- Countermobility capability by battalion
- Survivability by battalion
- Capability of theater engineer units
- Haul assets or support

Engineer Mission Analysis

Specified tasks - corps-directed obstacles
Implied tasks - mobility requirements for a passage of lines
Assets available - host-nation support
Time analysis - repositioning of the CATK force
Limitations - defeat mechanism
Risk - engineer's participation in deception
Essential tasks - engineer functions tied to defeat mechanism

Scheme of Engineer Operations

Engineer task organization and resource allocation supports corps's main effort
Obstacle control tied to maneuver-control graphics and force allocation

Figure 6-10. Engineer estimate in the defense

main defensive area and begin executing their deliberate breach

Breach and assault. The objective of the breach-and-assault phase is to penetrate the enemy's defense with the lead divisions and to isolate the division objectives with corps and theater assets. The fight at the obstacle is entirely a division fight. The focus of the corps and theater deep operations will continue to be on isolating the breaching areas from air and ground counterattack and to continue counterfire operations against enemy artillery. Enemy SCATMINE delivery systems are a likely PIR and are excellent HVTs for corps and theater fire-support systems. The corps engineer staff and the G2 plot likely minefield locations and delivery systems. The breach-and-assault phase ends when the divisions seize their initial objectives and eliminate enemy direct fire on the breaching sites.

Secure the breachhead. The attacking division quickly secures the breachhead in order to expedite the passage of follow-on forces. The corps-delineated breachhead line initially serves as a limit of advance and an area to pass follow-on forces. The size of the breachhead and the location of the breachhead line are driven by the size of the follow-on force, the amount of forces required to defend the breachhead from counterattack, and the location of enemy first-echelon artillery groups and reserves. The immediate concern is to clear the breachhead and eliminate all direct fires and all observed indirect fires that can affect the passage of follow-on forces. Simultaneous with securing the breachhead, the division begins establishing the necessary lane network. Reducing and marking additional lanes necessary to pass the follow-on forces, as well as to sustain forces within the breachhead, is a division-level operation. A system of traffic control within the breachhead is quickly established to support rapid and controlled movement on the lanes. This phase ends when the necessary lanes for both the forward passage and sustainment traffic are reduced, the breachhead line is secure against counterattack, and organized enemy resistance within the breachhead poses little threat to the breach lanes.

During the breach and assault phase, the FXXI division's terrain detachment will perform a terrain analysis using topographic products produced by its DTSS cell. This analysis and the products generated will enable the G2 to select an attack axis and define other terrain impacts on mobility. UAV, UAV/ASTAMIDS, and satellite platforms down link real- or near real-time imagery or information products to identify specific enemy obstacles and fighting positions. The division's reconnaissance and surveillance assets using the DRS, LRAS3, and Hunter Sensor Surrogate System (HS3) will provide continuous feeds of still and live imagery and other precision information related to enemy activity and/or mobility impacts. The information derived from these systems is linked to covering fires to enhance suppression, obscuration, and securing actions in support of the engineer's obstacle reduction effort. Breach lane and SA information can be shared via digital overlays with the higher HQ using the FBCB2 and/or the MCS if the FBCB2 has been fielded. If the FXXI division is not equipped with the Grizzly, this information is transmitted to the higher HQ using the FBCB2 and/or the MCS. The digital overlays will contain precise information that defines the status of exact entry and exit lane locations as the breach is developed. The division's maneuver brigade FBCB2-equipped vehicles speed movement through the breach and facilitate the maintenance of desired OPTEMPOs.

During planning for the breaching and assault operation, the FXXI corps engineer must consider the techniques and procedures used to handoff the breach lanes and obstacles to the engineer follow-and-support force. The corps engineer must determine if the follow and support force is or is not digitally equipped and plan handoff procedures accordingly. If it is not digitally equipped, it is likely that a greater number of face-to-face meetings and an exchange of liaison personnel will be required. The handoff would include the—

- Transfer of obstacle/restrictions.
- Other clearing or marking requirements.
- Additional critical information.

Monitoring the tactical situation via digital and voice systems, the corps engineer and staff are better able to monitor the division's securing of the breachhead. With this enhanced SA, the FXXI corps engineer and staff are better able to anticipate additional engineer requirements that may be required to—

- Clear the breachhead.
- Facilitate the expedient passage of follow-on-forces.
- Establish lane networks.
- Secure against counterattack.

To support securing the breachhead, the corps engineer and staff will plan the establishment of obstacle zones that will support a hasty defense at the breach head and apply obstacle control measures that do not restrict the mobility of divisional follow-on forces. These obstacle zones, once created, are disseminated via MCS-ENG to the division engineers. Associated details can be discussed via the exchange of free text messages or VTC.

Pass follow-on forces. Follow-on forces begin movement from TAAs in the rear of the breaching division to forward assembly areas (FAAs), to attack positions in the breachhead. Movement is centrally controlled by corps. As with any passage of lines, the breaching division controls movement within its sector as the in-place force. The breachhead line normally serves as the BHL for the in-place and passed units. While this phase is similar to any passage of lines, the restrictions imposed by moving on lanes through obstacles require some special traffic-control considerations. This phase ends with the completion of the forward passage of follow-on forces and the turnover of the lanes and traffic control to the corps.

Corps Commander's Responsibilities

The corps commander provides guidance and intent concerning the conduct of large-scale breaching operations. He controls the initial breach fight with lead divisions and the follow-on passage of divisions and corps. He and his key staff members may locate near the vicinity of the breach location for effective C2. He is responsible for applying the breaching tenet of intelligence; the breaching fundamentals of suppression, obscuration, security, and reduction (SOSR); the breaching organization of support, breach, and assault forces; mass; and synchronization to each echelon of planning.

Intelligence. Providing accurate, timely intelligence is critical to the success of a corps's breaching operation. This begins before the wargaming process with the plotting of enemy unit locations in the first and second echelons, artillery locations, and the locations of obstacle systems (IPB situation template). Updated terrain products (such as current satellite imagery maps of the breachhead and the MCOO) produced by the corps topographic company and terrain teams support this intelligence effort. The corps intelligence-collection plan and

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event template are developed during the wargaming process. A portion of the collection plan is dedicated to confirming template locations. This intelligence flow is continuous up to and beyond the start of the attack. The corps collection plan also focuses on deep operations that are critical to suppressing enemy fire-support assets and reserves, thereby isolating the battlefield. Every effort is made to push intelligence down to division level and below. The breaching division and its brigades supplement this plan by developing their own collection plans and R&S plans based on the same IPB process.

Breaching fundamentals. The corps commander maintains certain SOSR responsibilities at his echelon to allow the divisions and brigades to focus on the immediate fight at the obstacle. At corps level, the principles of SOSR are the same as at lower echelons, but the scope is different. The corps uses fire support and deep operations to *suppress* the enemy's defenses and isolate the battlefield. These operations serve to disrupt defenses at the breach sites and reduce the enemy's ability to reinforce or influence the battle by using its second-echelon forces or fire-support assets. The corps *obscures* the battlefield through the use of C2 countermeasures, including EW, OPSEC, and smoke/obscurants. Deception is also a critical aspect of corps-level obscuration of the breach operation, which serves to mislead the enemy commander as to the nature, time, and location of the corps operation. Corps responsibilities under the *secure* tenet are accomplished through deep operations and fire support to isolate the breach sites and protect them from enemy actions. CAS, AI, deep fires, attack helicopters, and air defense weapons are all tools available to the corps commander. Corps responsibilities to *reduce* obstacles include—

- Accepting lane handover from the forward divisions.
- Upgrading existing lanes to handle additional traffic.
- Clearing additional lanes to support the passage of follow-on forces.
- Maintaining the lane network.
- Providing movement control.

Breaching organization. The corps commander maintains certain responsibilities that assist lower-echelon support, breach, and assault forces to allow the lead divisions to focus on the immediate fight at the obstacle. To assist division *support forces* in eliminating the enemy's ability to interfere with the breaching operations, the corps commander provides deep-operations fire support. This fire support suppresses the enemy's defenses and reduces its ability to reinforce or influence the battle with second-echelon forces or fire-support assets. The corps obscures the battlefield through the use of C2 countermeasures, including EW and OPSEC. Deception is also a critical aspect of corps-level obscuration of the breach operation that misleads the enemy commander as to the nature, time, and location of the corps operation. The corps supports division *breach-force* missions to create lanes that enable the attacking force to pass through the obstacle and continue the attack with additional breaching assets and suppressive deep-operations fire support, along with needed obscuration. This also helps the corps to secure the breach site. To assist the breach force in reducing obstacles, the corps accepts lane handover from the forward divisions, upgrades existing lanes to handle additional traffic, clears additional lanes to support the passage of follow-on forces, maintains the lane network, and provides movement control. The corps supports division *assault-force* missions to destroy or dislodge the enemy on the obstacle's far side, primarily with suppressive deep-operations fire support.

Mass. Breaching is conducted by rapidly applying a concentrated force at a point in order to crack the obstacle and rupture the defense. Massed corps combat power is directed against

an enemy weakness. The location determined for large-scale breaching depends on a weakness in the enemy's defense where its covering fires are minimized. If the corps commander cannot find a natural weakness, he creates one by fixing the majority of the defending force and isolating a small portion of it for attack. The isolated portion is then suppressed to eliminate effective fire on division breach forces. Smoke and terrain are used to assist in isolating the force under attack. Suppression requires the corps commander to mass enough overwatching fires to achieve at least a 3:1 firepower ratio.

The corps commander also masses his engineers and breaching equipment to assist division breach forces reducing the obstacle. Division breach forces are organized and equipped to use several different reduction techniques in case the primary technique fails. Additional reduction assets--normally fifty percent more than required--are present to handle the unexpected. These additional forces are positioned with the division breach force. Achieving necessary mass for the assault requires the division breach force to open enough lanes through the obstacle to permit rapid passage and buildup of forces on the far side. A division normally requires a minimum of twelve lanes, allowing two brigades abreast with six task forces to pass simultaneously in column while minimizing lateral movement. The tactical situation may require additional lanes to pass a larger assault force quickly through the obstacle to achieve a sufficient combat-power ratio. The principle of mass influences the selection of the corps breaching location; the task organization augmenting division support, breach, and assault forces; and the integration of engineers in force movement or attack formations.

Synchronization. Breaching operations require precise synchronization of the SOSR breaching fundamentals by support, breach, and assault forces. Failure to synchronize efforts can result in rapid, devastating losses of friendly troops in the obstacle or in the enemy's fire sack. The corps commander ensures synchronization through proper planning and force preparation. Fundamentals to achieve synchronization are—

- Detailed reverse planning.
- Clear subunit instructions.
- Effective C2.
- A well-rehearsed force.

Corps Engineer Support

Corps engineers support large-scale breaching operations in many ways. The corps engineer assists the corps commander by providing detailed engineer estimates for the breach. Corps engineers augment division breach forces by providing them with additional assets to clear the necessary number of lanes to ensure the movement of follow-on forces through the breachhead. Normally, an engineer group with several corps engineer battalions is placed in a command relationship to each breaching division in order to give it efficient C2 of all engineer forces at the breach sites. This allows division engineers to accompany assault forces as they pass through the breaches to seize breachhead objectives. Corps engineers at the breach sites widen existing lanes and create additional ones to enhance corps mobility. As the breachhead is secured and follow-on forces pass through the in-place division, control of the breach site is passed to the corps to free the in-place division for future operations. Corps engineers continue route improvement and obstacle-clearance operations. Corps engineers with assault forces are prepared to install tactical obstacles to support the defense of the breachhead, including scatterable mines. Obstacles are also used in deep operations to isolate the battlefield and delay reserves. Corps engineers enhance movement in rear areas by maintaining and improving MSRs and repairing and upgrading bridges.

RIVER-CROSSING OPERATIONS

A river crossing is a special operation in that it requires specific procedures for success because the water obstacle inhibits ground maneuver in the usual way. It demands more detailed planning and technical support than normal tactical operations. It also features specific control measures to move the force across a water obstacle. The obstacle may be a river, lake, or canal. Unlike other obstacle types, the water obstacle remains effective during and after the crossing operation.

A successful river-crossing operation is one that moves more combat assets across a river than an enemy can mass against the crossing. Deliberate river-crossing operations are normally planned and conducted by corps and divisions. At the corps level, fundamental planning (including deception) and resourcing of corps assets to the division takes place. At these echelons, a major river crossing will involve most, if not all, of the assets of the organization involved. Extensive use of corps assets is required in the conduct of the operation. Divisions do not have sufficient support-force structure or capability to conduct a river-crossing operation. They cannot cross major water obstacles without corps assistance and still be expected to press the fight. The corps assigns missions and provides the necessary support and equipment. Specifically, the corps provides augmentation in the following areas:

- Engineer forces.
- Fire support.
- Air defense.
- Smoke.
- MP.
- EW.
- Attack helicopters.

Rarely will a river crossing be a specified task within the corps's mission. More often, a river crossing will be an implied task for a lead division. The corps will designate the bridgehead for an offensive river crossing and will normally depict the bridgehead graphically using a bridgehead line or a set of division objectives. The bridgehead is the area on the far bank that is to be secured to continue the offensive. It provides space for those combat, CS, and critical CSS elements that are necessary for the corps to continue the attack. The bridgehead must be defensible, be large enough to maneuver and deploy the force required to continue the mission, and facilitate continuation of the operation. For divisions crossing the river and continuing the attack, a shallow bridgehead of about 30 kilometers (19 miles) may be used. If the corps intends on passing a division through the bridgehead, a deeper bridgehead of 40 to 50 kilometers (25 to 30 miles) may be required, depending on the terrain. Divisions normally assign bridgehead objectives and control movement across the river. Brigades assault across the river and secure the bridgehead as an element of a larger force.

River-crossing operations are performed no differently in the FXXI corps or its divisions. However, the ability to acquire more detailed and current information related to the crossing is possible with the fielding of the DTSS and Land Warrior. Reconnaissance engineers are now able to provide precision measurements and imagery of water obstacles with tactical reports submitted. In addition, the DTSS can quickly provide detailed hydrological information, soil composition, and other terrain data that are critical to the operation. The digital sharing of this information via the corps and division ABCS can shorten planning time and enable the coordination that properly integrates and synchronizes technical support. During the planning process, the corps engineer can electronically share information with subordinate engineer elements and the commander of the lead division executing the river crossing. This includes the exchange of preliminary planning data and digital overlays that can be constantly updated up to the point of execution. These capabilities also give the corps engineer the flexibility needed to transition to other branches or sequels of the crossing quickly as emerging SA or the tactical situa-

tion dictates. These digital systems also facilitate the survivability of friendly HPT targets such as the Grizzly or the Wolverine since these mobility systems can be moved from hidden positions to support bridging operations on an as-needed basis.

Both corps and division headquarters anticipate and plan for river crossings in advance. Division and brigade commanders organize their forces into bridgehead, support, and breakout forces for river-crossing operations. Bridgehead forces seize and secure the bridgehead. Support forces consist of corps combat engineer battalions; corps bridge companies; light engineer diving teams; and MP, EW, and chemical units. These units provide crossing means, traffic control, and obscuration. Breakout forces cross the river behind bridgehead forces and attack out of the bridgehead oriented on subsequent objectives. The division commander normally designates an assistant division commander as the crossing-force commander (CFC) to take charge of controlling the division crossing. A crossing force receives planning support from a crossing-force engineer (CFE) who is normally the commander of a corps engineer group in support of the division. He provides additional staff planners for

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CORPS ENGINEER SUPPORT

Corps engineers contribute most to the relief in place by assisting the corps in achieving speed and control. As the two corps G3s collocate to develop the maneuver plan for the relief in place, the collocated corps engineer staffs develop a unified scheme of engineer operations. Both corps engineer staffs fully understand the scope of the mission, including the defensive plan and the concept for the relief in place, in order to determine engineer tasks needed to maintain speed and control.

Mobility Support

Both staffs recommend engineer task organizations that provide in-stride mobility operations to brigades moving to, through, and from friendly defensive positions. A review of the relieved unit's defensive plan overlaid with the relief-in-place concept is conducted. The routes and avenues for entering and exiting units are clearly identified and marked, with mobility requirements being determined for each route. The relieved corps has the responsibility to fully prepare the routes through its AO. The relieved corps engineer staff allocates mobility resources to assist in preparing these routes for movement. Additionally, both corps engineer staffs ensure their respective corps have the capability to conduct in-stride breaching operations in the event lanes are closed during movement.

Obstacle Turnover

The relieved corps engineer staff consolidates and provides obstacle locations, configuration, and composition to the relieving unit. The two corps engineer staffs develop detailed plans for the turnover of corps reserve demolition obstacles, corps obstacle zones, and planned ORAs. When developing the obstacle-turnover plan, the relieved corps engineer staff requires detailed and current status on the obstacle belts and zones in his AO. They receive updated obstacle reports from all subordinate units and compile a complete list of all individual obstacles emplaced in the corps area and updates the corps obstacle overlay. This information is then passed to the relieving corps engineer staff. Both staffs determine the details of how existing corps reserve demolition obstacles or those obstacles being emplaced will be exchanged. The presence of engineer LOs at every echelon of the relieving unit down to the maneuver company or team level is critical to the speed and control of obstacle turnover. Upon linkup, the engineer LOs from the relieving units become thoroughly familiar with the existing obstacles, including the direct- and indirect-fire control measures integrated with the obstacles. The engineer LO also assists the relieving maneuver commander in integrating obstacles into his defense plan and improving unit defenses against subsequent enemy attacks.

PASSAGE OF LINES

A passage of lines is an operation in which one force moves through another. A passage of lines can be conducted forward or rearward. The corps as a whole may participate in a passage of lines as the passing or stationary force. Additionally, corps offensive and defensive operations often include passage of lines involving subordinate units. An example of a corps forward passage of lines is when a corps, as an operational or theater reserve, conducts a counterattack through friendly forces in contact with the enemy. An example of a rearward passage of lines is when a corps-controlled covering force passes through and transfers combat responsibility to MBA divisions.

PLANNING

Successful passages of lines are characterized by detailed, centralized planning and decentralized execution. The passing of control between passing and in-place corps or the corps's

subordinate units is one of the key considerations in any passage of lines. The commanders of the corps involved establish a mutually agreed-upon event that triggers the passage of control. Once control is passed, the passing corps exercises tactical control (TACON) over the in-place corps until all of its forces are beyond the direct-fire range of the in-place forward divisions. However, during a rearward passage of lines, control is passed from the rearward passing unit to the in-place corps unit. Forces in the rearward-passing corps come under TACON of the in-place corps once they are committed to the passage routes or corridors. Whether conducting a forward or rearward passage, the in-place corps has the responsibility to provide mobility for the passing unit along cleared routes or corridors through its sector.

If the passing and passed corps are both digital, the digital exchange of information speeds both the planning and execution process. Digitalization of both units may also eliminate the need to collocate HQ and exchange liaison personnel. For example, digital overlays will show waypoints, routes, corridors, passage points, and other information critical to movement and survivability of the passing unit. These overlays are supplemented with orders and free text messages that define related-to triggering events and other particulars such as fire and mobility support requirements. The passage can be expedited based on the ability of the maneuver brigades to identify friend from foe and conduct precision movement.

CORPS ENGINEER SUPPORT

The corps engineer and his staff thoroughly understand when engineer functional and unit control is passed, the disposition of engineer forces, and engineer missions at the time of passage. Close coordination and joint planning between corps engineer staffs are critical to the success of the passage of lines. When control is passed between corps, the corresponding corps engineer brigade commander may assume TACON of all engineer forces of the passing or in-place corps. The corps engineer brigade commander can then task engineers of the adjacent corps based on immediate requirements during passage. This is critical in the forward passage of lines, since it affords the passing corps engineer brigade commander with a means of accomplish unforeseen engineer tasks with minimal impact on engineer support to the subsequent attack.

Collocated Corps Engineer Staff Planning

The corps engineer staffs of both passing and passed corps collocate during the planning and execution of the passage of lines. They focus initially on exchanging information, including individual obstacle locations and routes through the sector. This information also includes the details and execution criteria for corps-directed reserve demolition targets and situational obstacles. The passing corps engineer staff then ensures dissemination of the information to subordinates through coordination with the G3 and instructions in the corps OPORD, engineer annex, and overlays. C2 of both passed and passing corps engineer units during the passage of lines transfers to the corps exercising TACON. The corps engineer staff of the corps with TACON facilitates control of engineer units during planning and execution of the passage by having an accurate status of all engineer assets, activities, and obstacle control measures in the sector.

When both the passed and passing corps are equipped with digital systems, the information exchange and dissemination described above is conducted automatically by viewing the icons on the systems. TACON is also enabled by the ability of the corps engineer staff to digitally monitor the status, activities, and obstacle control measures in sector. As fielded, the FBCB2-equipped Grizzly will pass tactical reports and update graphic overlays to the maneuver brigade HQ regarding the status of the engineer effort. The brigade engineer will also pass status reports and overlays from the FBCB2 systems via MCS to higher HQ. This constant exchange of electronic information allows the corps and

division engineers to provide a more proactive response when needed, to the maneuver commanders, based on data that is minutes versus hours old.

In-Place Corps Engineer Execution

The in-place corps engineer staff conducts a complete analysis of the passage-of-lines concept operations. The in-place corps normally tasks subordinate maneuver units to prepare the passage routes or corridors. The in-place corps engineer staff recommends a task organization of engineer forces to the divisions, separate brigades, and calvary regiments based on assets needed to clear assigned routes and corridors. Clearing operations are conducted prior to the initiation of the passage. Additionally, the in-place corps engineer staff plans the closure of lanes through obstacles, if required, once the passage is complete.

In the FXXI corps, the corps engineer is better able to develop his recommendation for engineer task organization based on real-time logistical information drawn from the CSSCS. The analysis of this logistical data provides the corps engineer a clear picture of a personnel and an equipment status as well as an on-hand balance of the supplies by unit.

Passing Corps Engineer Execution

The passing corps engineer staff task-organizes corps engineer assets to assist in-stride breaching operations prior to the passage of lines. This ensures rapid support for mobility operations and continuation of the passage in the event a route is shut down during the mission. Creating lanes through the in-place corps's obstacles requires permission from the corps exercising TACON. Authority to reduce friendly obstacles in response to an immediate tactical situation may be given to the corps's subordinate units. The authority is included in the coordinating instructions of the corps

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APPENDIX A

ORDERS AND ANNEXES

Orders and annexes are critical components of corps engineer C2. The corps engineer brigade commander exercises functional control over engineer operations within the corps (engineer units supporting maneuver divisions, separate brigades, and cavalry regiments) by including critical instructions in the corps order and the engineer annex. The corps engineer brigade commander also issues a unit order to exercise both functional and unit control over forces committed to corps-level operations. These units are normally task-organized by the corps under the control of the corps engineer brigade commander. Therefore, it is imperative that the corps engineer brigade commander understands how to use the combination of corps and unit orders to convey the plan.

In the FXXI corps, the staff, using MCS word processing software, can produce orders and annexes rapidly. The electronic dissemination of these materials facilitates early planning at all command levels and allows planners to concentrate their efforts on development of the plan and its attendant contingencies branches and sequels. The VTC is also an alternate FRAGO.

This appendix is divided into two major sections. The first section deals with the corps OPORD, the engineer annex, and the topographic operations annex. This section provides the base format of the corps OPORD, highlighting areas where the corps engineer may have direct input. It also outlines the format and content of the engineer and topographic operations annexes and provides sample overlays. The second section focuses on corps engineer unit orders. It provides a format and content for the corps engineer unit WARNORD and OPORD, including possible annexes, overlays, and FRAGOs.

THE CORPS OPORD, THE ENGINEER ANNEX, AND THE TOPOGRAPHIC OPERATIONS ANNEX

CORPS OPORD

Figure A-1, pages A-2 through A-5, is a sample format of the corps OPORD. Paragraphs in which the corps engineer brigade commander may provide engineer input are highlighted.

ENGINEER ANNEX

The engineer annex contains information not included in the base corps order that is critical to the corps engineer plan or required for subordinate engineer planning. It does not include instructions or orders directly to corps engineer units. All instructions or tasks are addressed to maneuver divisions, separate brigades, and cavalry regiments not supporting corps engineer units. More important, the engineer annex covers critical aspects of the entire engineer plan, not just parts that pertain to engineer units. The engineer annex is not a replacement for a unit order. For example, it does not give subunit orders and service support instructions to engineer units remaining under the corps engineer brigade command;

those orders and instructions are contained in the corps engineer brigade order. The engineer annex should meet the following general criteria:

- Includes critical information derived from the EBA process.
- Contains all critical information and tasks not covered elsewhere in the order.

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(Classification)

Copy _____ of _____ copies
Issuing Headquarters
(Place (coordinates) country)
(Date-time group, month, year)
(Message reference number)

OPERATION ORDER (number) (code name, if used)

Reference(s): Map(s) and other references required.
Time Zone Used Throughout the Order:

Task Organization:

- **Must accurately reflect the engineer task organization of the unit's supporting maneuver divisions, separate brigades, and cavalry regiments, including the command or support relationship.**
- **List units under the corps engineer brigade commander's command.**
- **List units remaining under corps control.**

1. SITUATION.

a. Enemy Forces. Include recent enemy engineer activities or capabilities that are critical to maneuver division, separate brigade, and cavalry regiment commanders or are essential to understanding the corps engineer plan.

b. Friendly Forces.

c. Attachments and Detachments.

- **State the effective time for engineer task organization if it differs from other units.**
- **Clarify or highlight changes in engineer task organization that occur during a phase of the operation. For example, releasing corps control of bridge units to divisions.**

2. MISSION.

3. EXECUTION.

Intent.

a. Concept of the Operation.

(1) Maneuver.

(2) Fires.

(3) Counterair operations.

Figure A-1. Corps OPORD

APPENDIX B

ENGINEER ESTIMATE

The engineer estimate is an extension of the command-estimate procedure. It is a logical thought process that is conducted by the engineer staff officer concurrently with the supported maneuver force's tactical planning process.

In the FXXI corps, the engineer-estimate process is enabled by digital systems. ABCS interoperability improvements have enhanced the commander and staff's ability to share large amounts of intelligence and planning information. His can compress the decision-making cycle, abbreviate the deliberate decision-making process (DDMP), and modify COA selection. For example, enhanced SA and the ability to receive or "pull" information from ABCS databases and other data sources and collaboratively share that information can lead to either COA development and decision. These digital capabilities may allow the staff officer to omit or bypass DDMP or EAB steps. The experimental force (EXFOR) commander and the staffs participating in the advanced warfighter experiments (AWEs) validated this emerging process. This modified decision-making/COA process also impacts future battle planners. Since decisions may be arrived at somewhat earlier, these planners must constantly maintain an SA and RCP equal to that of the current battle planner. The future battle planner must be able to anticipate the subtlest change in the tactical situation. As he sees the tactical changes unfold, he must make corresponding adjustments that foster a smooth transition from one plan of action to another without interruption to the desired OPTEMPO.

The engineer-estimate process —

- Generates early integration of the engineer plan into the combined arms planning process.
- Drives the coordination between the staff engineer, the supported commander, and other staff officers.
- Drives the development of detailed engineer plans, orders, and annexes.

Each step of the engineer-estimate process corresponds to a step of the command-estimate procedure. Like the command estimate, the engineer estimate is continuously refined. Table B-1 shows the relationship between these two estimates. A more detailed discussion of each step of the engineer estimate process is found in the following paragraphs. The command-estimate procedure provides the framework for discussion of the corresponding engineer-estimate actions.

Table B-1. Estimate of the situation and engineer estimate

Estimate of the Situation	Engineer Estimate
Mission	Mission
Facts and Assumptions	IPB/EBA
Mission Analysis	Engineer Mission Analysis
Commander's Guidance	Scheme of Engineer Operations Development
COA Development	Engineer Plan (War-Game and Refine)
COA Analysis	COA Recommendation
Decision	Final Engineer Plan
Actions and Orders	Orders

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RECEIVING THE MISSION

The staff engineer quickly focuses on several essential components of the basic order and engineer annex when he receives the mission. These are—

- The enemy situation.
- The mission paragraph.
- The task organization.
- The logistics paragraph.
- The engineer annex.
- The topographic operations annex.
- The type of operation (offensive or defensive).
- The current intelligence picture.
- The terrain analysis.
- The assets available.
- The time available (estimate).

FACTS AND ASSUMPTIONS

Developing and refining facts and assumptions is a continuous process. The maneuver commander relies on the staff to present him with facts and assumptions on which he can base his mission analysis, restated mission, and course-of-action development. Facts and assumptions pertain to the enemy as well as the friendly situation. The staff engineer uses the EBA as the framework for developing facts and assumptions.

ENGINEER BATTLEFIELD ASSESSMENT

The EBA consists of three parts (see Table B-2):

Table B-2. Engineer battlefield assessment

- Develops facts and assumptions about--
  - Enemy engineer weaknesses.
  - Critical friendly engineer capabilities and requirements.
- Mutually supports the G2/S2's IPB.
- Contains three components:
  - Terrain analysis.
  - Enemy mission and engineer capability.
  - Friendly mission and engineer capability.

APPENDIX F

ENGINEER DIGITAL SYSTEMS

The engineer systems discussed in this appendix are those that directly impact FXXI corps engineer planning and operations. Some of these systems, such as the Grizzly, Wolverine, Land Warrior with a DRS function, and UAV/ASTAMIDS, are in various stages of development and are not yet fielded. They are included in the discussion of engineer digital systems since they provide a baseline understanding of systems capabilities and may be used in future simulation exercises, AWEs, and demonstrations.

MANEUVER CONTROL SYSTEM – ENGINEER

The MCS-ENG is an engineer-specific software system that is subordinate to the MCS. It is software that will reside on the MCS version 12.0+. The system provides automated C2 capability to engineer staffs and commanders. MCS-ENG operates on the Army Tactical Command and Control System (ATCCS) common hardware. It provides engineer information to MCS, provides specific engineer planning and operations tools, allows engineers access to interface with terrain DTSS products, and links with intelligence and maneuver data. The MCS is a C2 system which provides the maneuver commander and his staff (corps down to separate maneuver brigades) with automated assistance to execute precise, near real-time C2 of combat forces. Data transferred electronically over LAN/wide-area network (WAN) through available communications media, using MCS protocols feeds information down to the FBCB2 systems. Basic missions of the system are inputting, processing, and outputting data to support the MCS-ENG information requirements. The MCS-ENG automation system contains an automated interface to the MCS.

EMPLOYMENT CONCEPT

FXXI engineer elements supporting the FXXI corps and the division maneuver brigades will receive the first MCS-ENG software. A downsized version of the MCS-ENG software will also be initially distributed to engineer companies supporting the maneuver brigade's battalions to enable digital engineer reporting and C2. This downsized version distributed to engineer companies will be a part of the FBCB2 system.

PLANNING CONSIDERATIONS

The MCS-ENG functionality allows the engineers to develop detailed engineer plans and support the maneuver commander with the following capabilities:

- Operations, which include—
  - Client-server relationship with a terrain evaluation model (TEM).
  - Engineer task organization.
  - Mobility-corridor evaluation.
  - Resource allocation & scheduling.
  - Bill of materials.
- Mobility, which includes—
  -- Ground-distance overlay.
  -- Potential LOCs.
  -- Corridors.
- Countermobility, which includes—
  - Obstacle planner (analyzer).

  - Obstacle effects (ditches/berms, craters, Raptor ICO, and minefields).
- Survivability, which includes—
  - Planner (position excavation and weapons-effects calculations).
  - Construction (crew-served weapons and vehicle positions and TOCs).
- Digital Terrain Data, which includes—
  - Digital Terrain-Elevation Data (DTED I & II).
  - Interim Terrain Data (soil, slope, vegetation, transportation, drainage, and obstacles).
- Tactical Decision Aids, which includes—
  - Terrain data query (LOCs and data extraction).
  - Intervisibility (optical LOS, communications sitings, and weapons fans).

RAPTOR INTELLIGENT COMBAT OUTPOST

OVERVIEW

The Raptor ICO is an emerging engineer system designed to enhance the combat power of the FXXI Army. It is a two-part system. The first part is the ICO sensor-communications subsystem. Originally part of the intelligence-minefield (IMF) initiative, this subsystem, now officially designated the Raptor ICO, represents an evolutionary leap in the employment of obstacles on the modern battle space. The second part is the Hornet wide-area munition (WAM) with a computer gateway-linked control subsystem. This subsystem is designed to replace the CIRCE currently used with the Hornet PIP munition. Figure F-1 shows the evolution of the mine from the M-15 to the Raptor ICO.

RAPTOR-ICO COMPONENTS

Raptor ICO integrates a number of independent systems. Each package includes a control station, two Gateways, three long-range overwatching sensors, internal/external Single Channel Ground-Airborne Radio System (SINCGARS) communication systems, and up to 16 smart WAMs.

The control station is the link between the ICO and the ABCS. It provides the maneuver headquarters the ability to detect or override the actions of the ICO, receive situational targeting information from the Gateway, and initiate a self-destruct or recovery sequence, if required.

Gateway

The Gateway is the intelligent nerve center for the Raptor ICO. It possesses the artificial intelligence to perform as an unattended C2 hub, or it can receive commands directly from the control station. The Gateway receives and implements orders, renders reports, tracks subordinate weapons status and enemy activities, selects and employs attack tactics, and calls for reinforcing fires, as required. Gateway computers are capable of being programmed with a variety of engagement tactics to meet the commander's intent through consideration of such factors as the friendly and enemy situation (METT-T) and the effect of terrain on maneuver (OCOKA). For example, the Gateway can identify, request orders, track, engage, or report. Gateway is—

- The brains of the system; it—
  - Controls all Hornet PIP.
  - Directs who/when/how to attack.
  - Receives intelligence information from the acoustic sensors.
- The communications link to the control station.

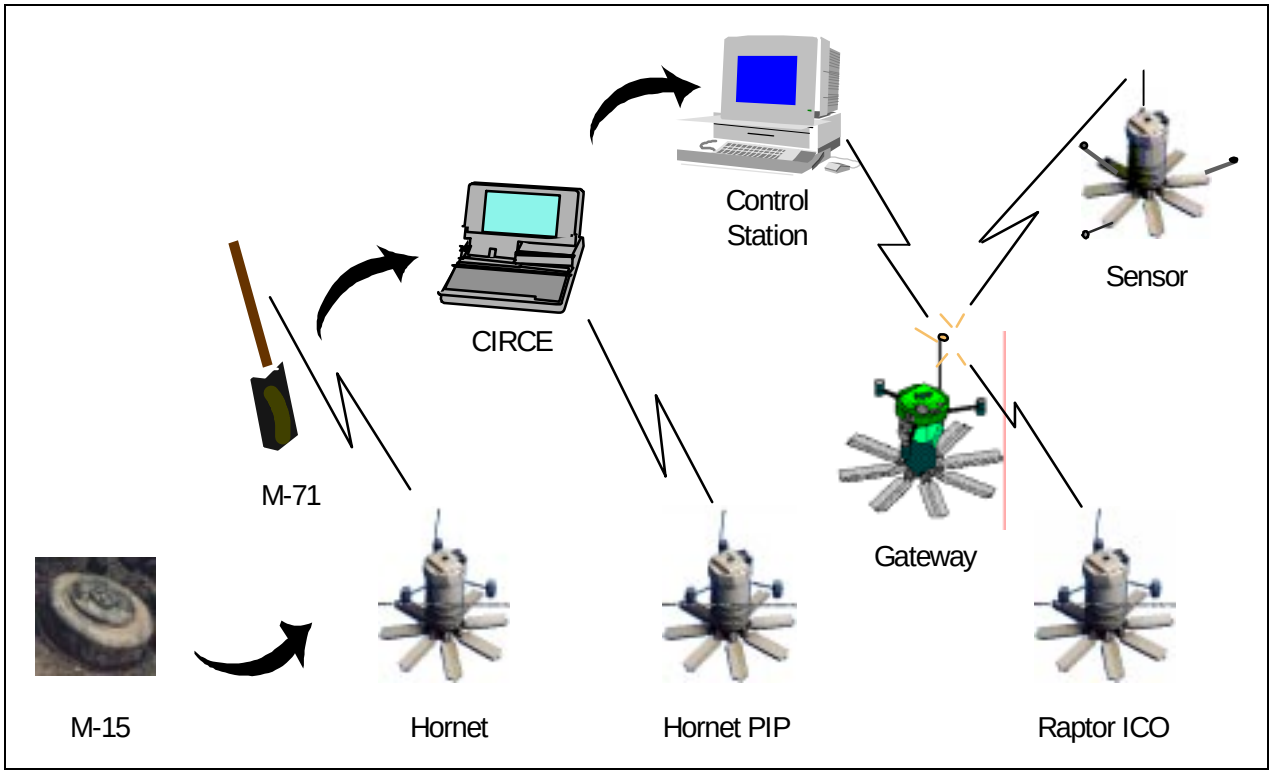

Figure F-1. Evolution of the Raptor ICO

– 30-km range to control station.

– 1,500-m range to munitions.

Over-watching Sensor (OS) (Acoustic)

The OSs provide the ICO Gateway and control station with the SA required to perform C2 and intelligence functions. The OSs are the external listening and observation capability of the system. These sensors will simultaneously report enemy movement, provide detailed and accurate intelligence, request fire support, assess target-acquisition data, and engage targets as directed. The OSs are deployed among and forward of the munitions to provide early target detection and more accurate information for the Gateway and the Hornet munition.

EMPLOYMENT CONCEPT

The Raptor ICO has applicability at all levels to control and dominate the battle space. Figure F-2 page F-4, depicts Raptor ICO's versatility and capability. Raptor ICO provides the commander both a new SA sensor capability and an intelligent obstacle that can discriminate between targets. The ICO combines munitions, sensors, and communications hardware through programmed control stations to detect enemy vehicles and report that detection back to the corps and division CPs. Dependent on the commander's wishes to employ the systems in either a supporting or economy-of-force role, the corps engineer will use deployment techniques in creating a Raptor-ICO obstacle that takes full advantage of the terrain.

This munition can be remotely activated (turned on/off) to facilitate shaping the battle space and to protect the commander's forces. the ICO allows the commander to safely maintain unmanned lethal systems in friendly areas that he has identified as

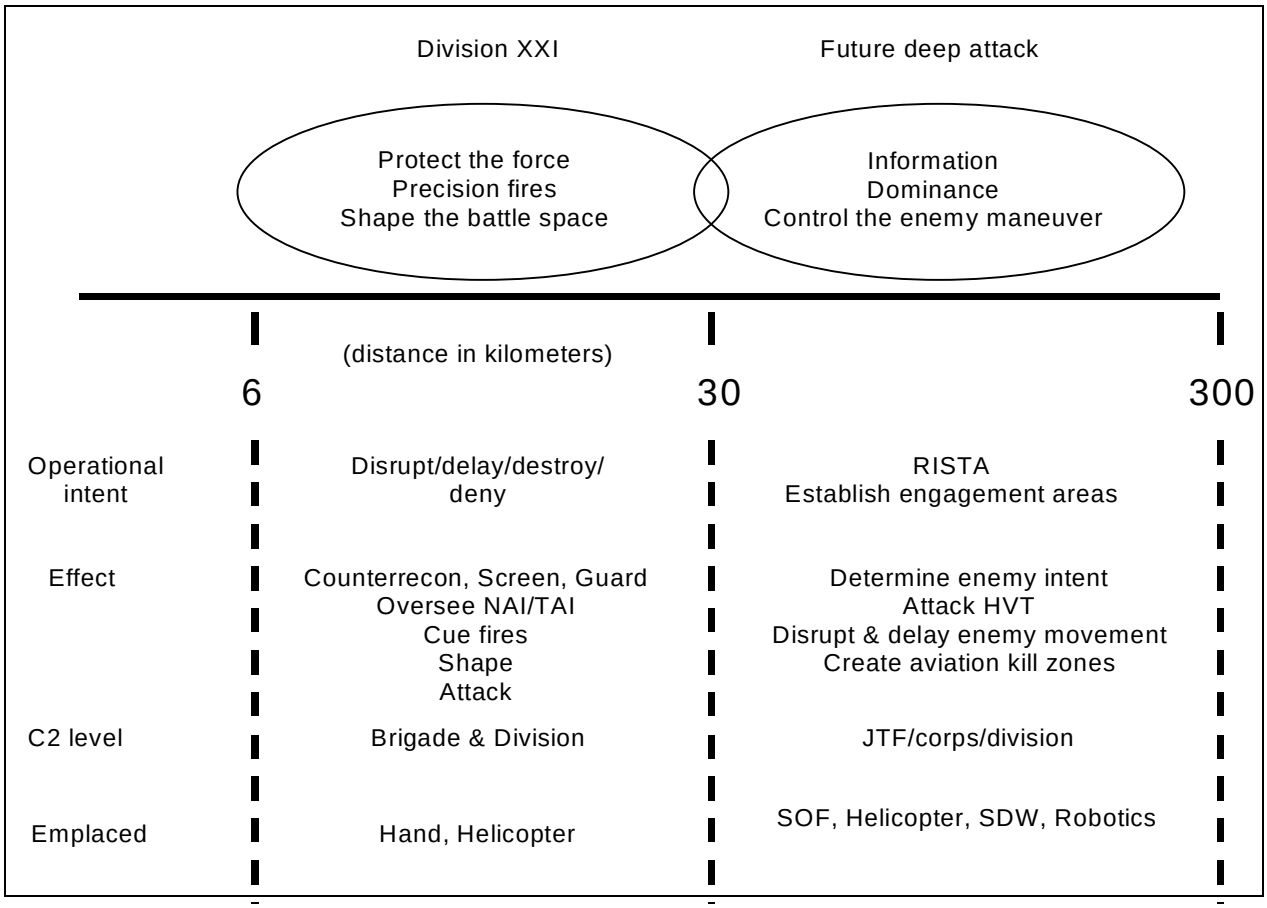

Figure F-2. Raptor ICO's versatility and capability

potential danger points or to protect friendly HPT/HVT assets. This capability conserves his critical combat power, allowing him to monitor these areas continually, interdict enemy actions, and control the enemy's movement. Raptor, placed out of sight, can be used to remotely monitor and attack the enemy on key terrain, along likely avenues of approach, critical choke points, and to guard flanks or screen a unit's front. It may also be used as an outpost or listening post.

EMPLOYMENT CONSIDERATIONS

The corps commander will have numerous systems under his control and must rely on his staff to plan, integrate, and control each system properly into all plans and operations. The corps commander, through the corps engineer or SES, will exercise C2 over Raptor ICO through the planning, preparation and execution phases of all operations. Raptor-ICO planning and integration by the corps engineer will follow doctrinal C2 processes. The division engineer will control Raptor-ICO employment, monitoring, handoff, and/or system recovery in the division's battle space. Because of its prospective intelligence gathering capability, the employment of the Raptor ICO is closely coordinated with the G2. Used as a mine, its use will be coordinated with the G3 to facilitate shaping of the battle space and the FSCOORD for the synchronization of direct and indirect fires (see Figure F-3).

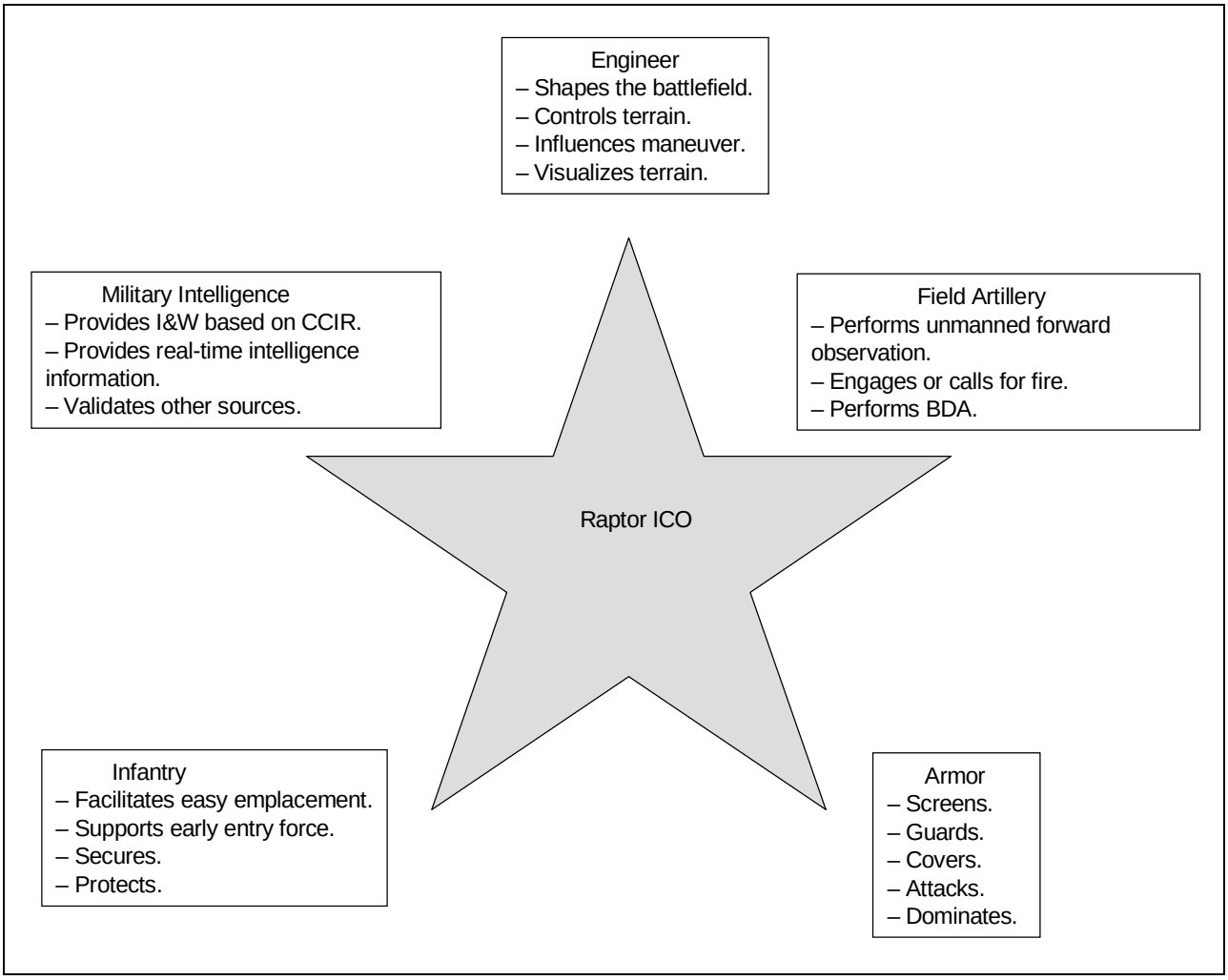

Figure F-3. Raptor-ICO employment considerations

ENGAGEMENT PROCEDURES AND TACTICS

As stated earlier in this appendix, Raptor ICO can be employed to control and dominate the battle space. It can be emplaced and armed by either engineer personnel or SOF. Figure F-4, page F-6, demonstrates how Raptor ICO can be used in an economy-of- force role. In the scenario shown, Raptor ICO could be emplaced along likely avenues of approach by either the aerial insertion of an engineer squad or by delivery of the sensors or by air or artillery means. The Raptor ICO, in this case, is remotely monitored and used to identify the enemy axis of advance, protect the flanks of the main attack, and trigger other tactical actions to disrupt the enemy's movement.

Situation:
The enemy's combined-arms army (CAA) is moving west. A FXXI division conducts an attack to destroy an enemy's tank division.

1 The UAV identifies the main attack. The Raptor-ICO fields are emplaced on likely avenues of approach.

2 Raptor ICOs and UAVs identify the enemy's main axis of advance for the division.

3 The Brigade assets and Raptor-ICO fields protect the division's flanks by tracking the enemy's motorized rifle division (MRD).

4 The Raptor ICOs trigger attack aviation. Attack aviation conducts an attack on the northern MRD.

5 The Raptor ICOs trigger an airmobile attack on the southern enemy division. The division's maneuver brigade completes the destruction.

End State: The division attack neutralizes two enemy divisions.

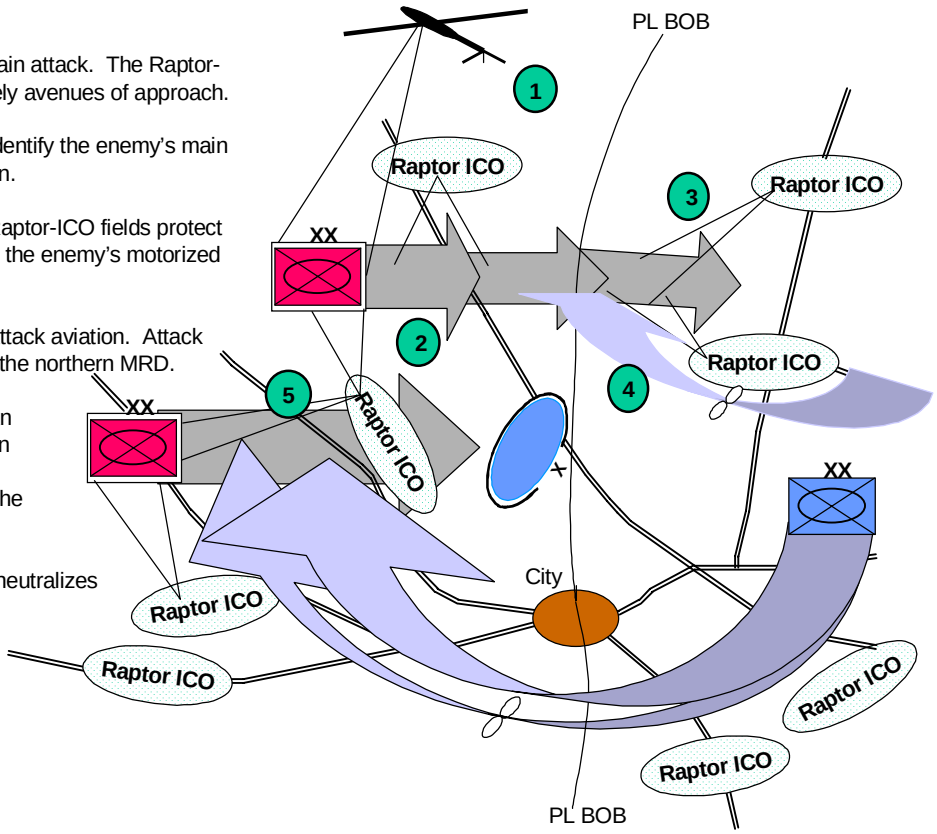

Figure F-4. Raptor ICO in an economy-of-force role

Figure F-5 demonstrates how the engineer might employ Raptor ICO in support of the deep fight. Raptor ICO is placed well forward to gather intelligence related to the enemy's movement; provide early warning; and trigger deep attacks by either the CAS, the long-range artillery or aviation systems, working in conjunction with cavalry, or air-mobile operations.

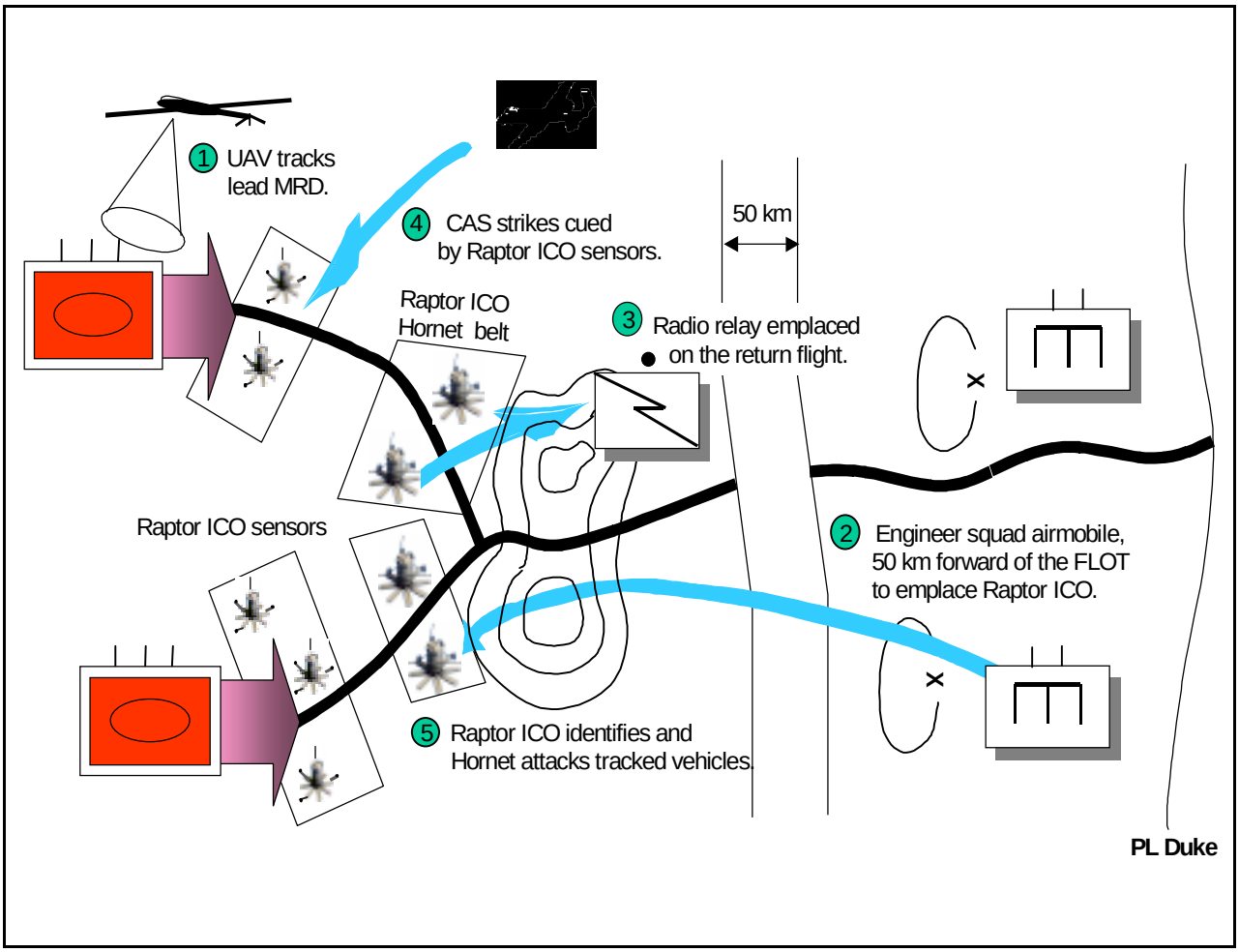

Figure F-5. Engineers conduct Raptor raids in support of deep operations

Figure F-6, page F-8, illustrates how the Raptor ICO may be used during cross-FLOT operations in support of a combined-arms attack. In this case, the engineer would employ Raptor ICO as part of a combined-arms trap.

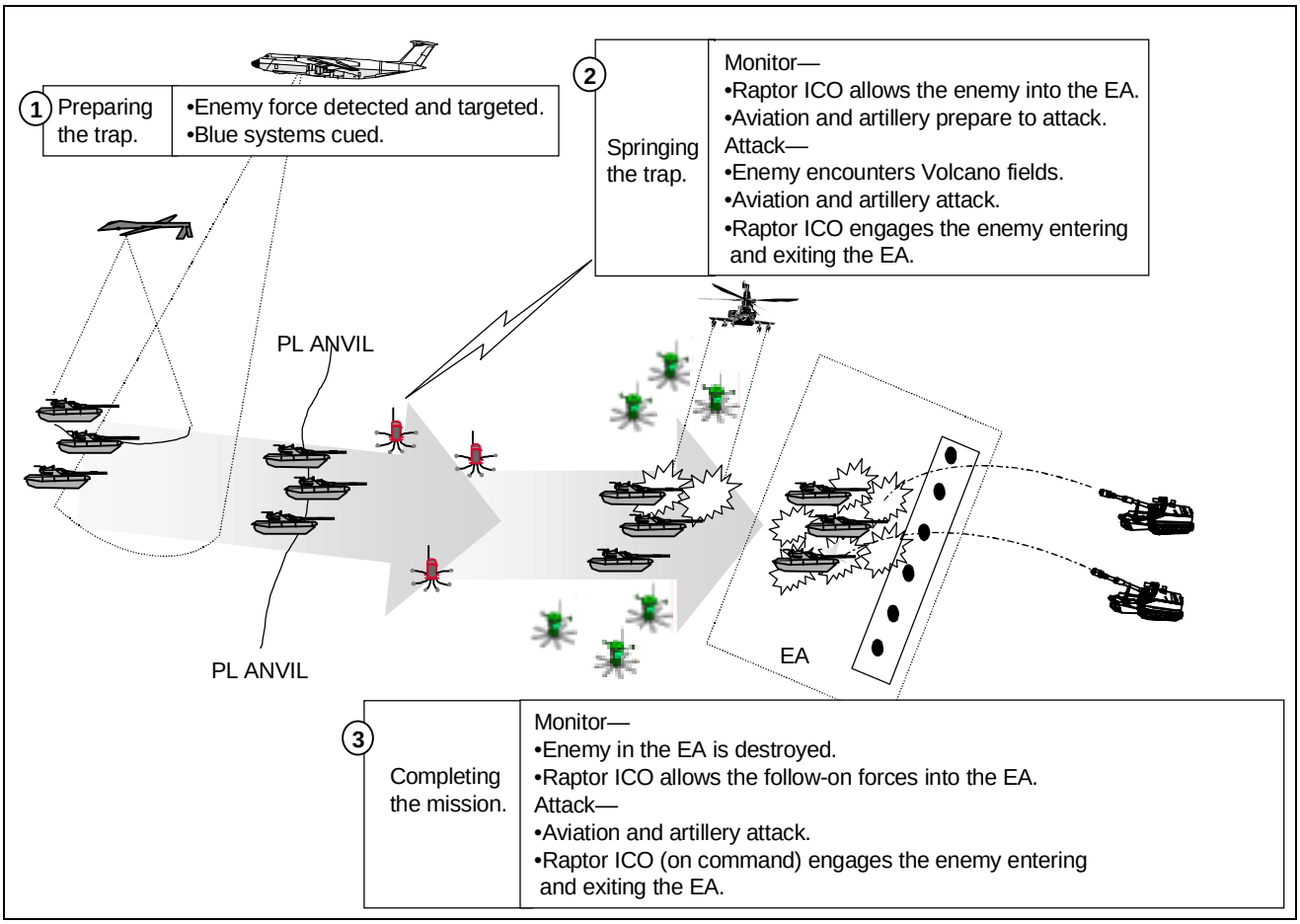

Figure F-6. Raptor ICO used in a combined-arms trap

Figure F-7 illustrates those actions/activities that would be performed following a maneuver commander's establishment of targeting priorities and attack strategies. In this case, the target identification and targeting process begins with the alert provided by Raptor ICO acoustical sensors. Attention should be paid to the connectivity of the ABCS, the information flow between systems, information outputs, and the actions/activities performed by each activity to obtain maximum effectiveness of both digital systems, and weapons platforms.

Figure F-8, page F-10, illustrates the use of the Raptor ICO's Hornet and acoustical sensors, employed as a disrupt obstacle, in an X-pattern. While the X-pattern is highly effective, other types of obstacles such as Volcano should be integrated with Hornet and Raptor ICO (when available) to achieve turning, blocking, or fixing effects.

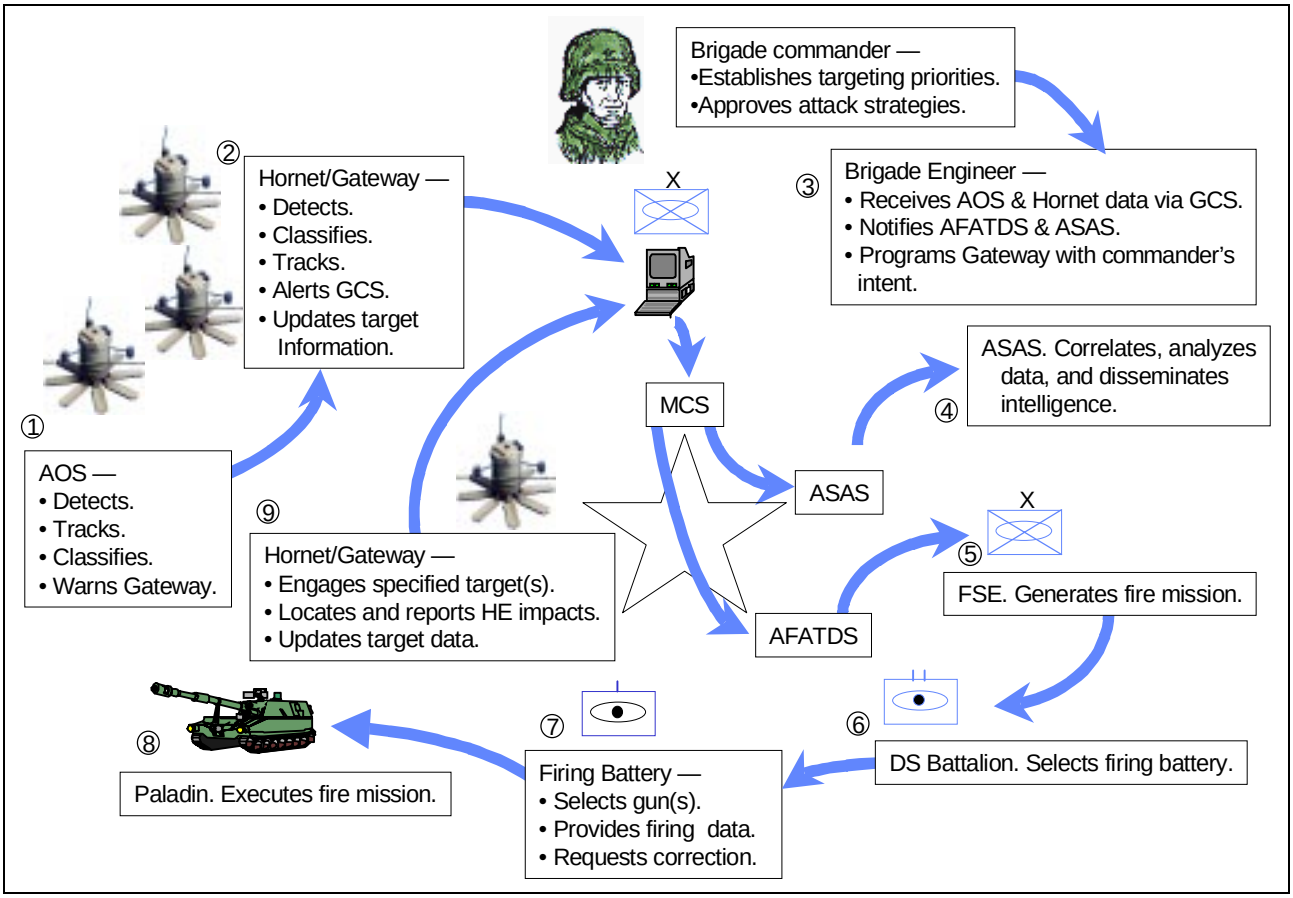

Figure F-7. Connectivity and synchronization

Figure F-9, page F-11, illustrates the Raptor ICO's Hornet and acoustical sensors, when employed in a gauntlet pattern. This pattern of deployment is very effective in constrictive terrain, along the enemy's likely avenue of approach.

Figure F-10, page F-12, illustrates the manner that Hornet, WAM clusters, and Volcano may be employed with existing terrain features to provide early warning and facilitate shaping of the corps's battle space. As illustrated below, when the Raptor ICO systems are fielded and replace the wide area mine Hornet PIP munitions, the overall concept of integrating all natural and man-made obstacles together will remain the same.

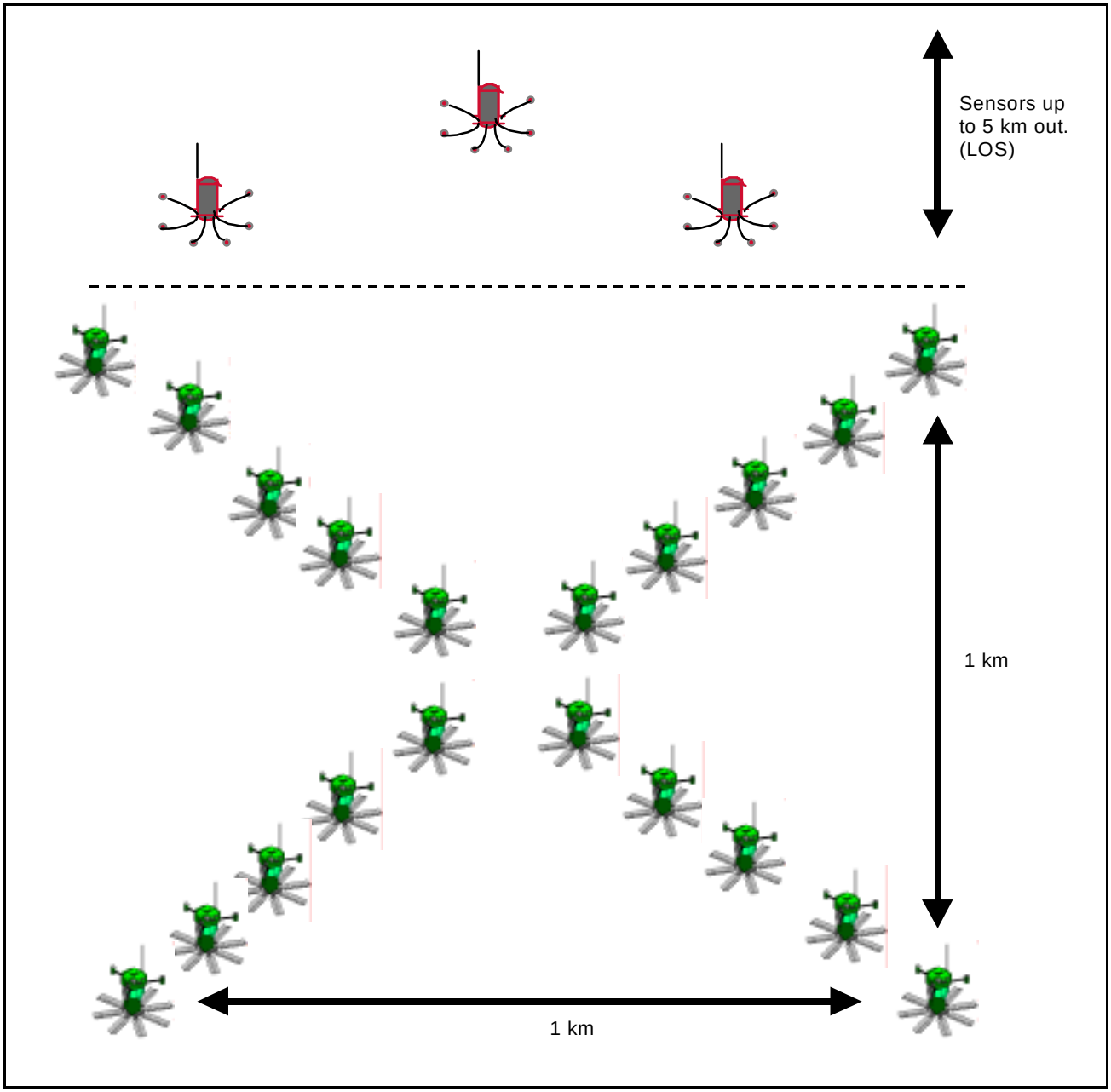

Figure F-8. X- pattern, disrupt obstacle

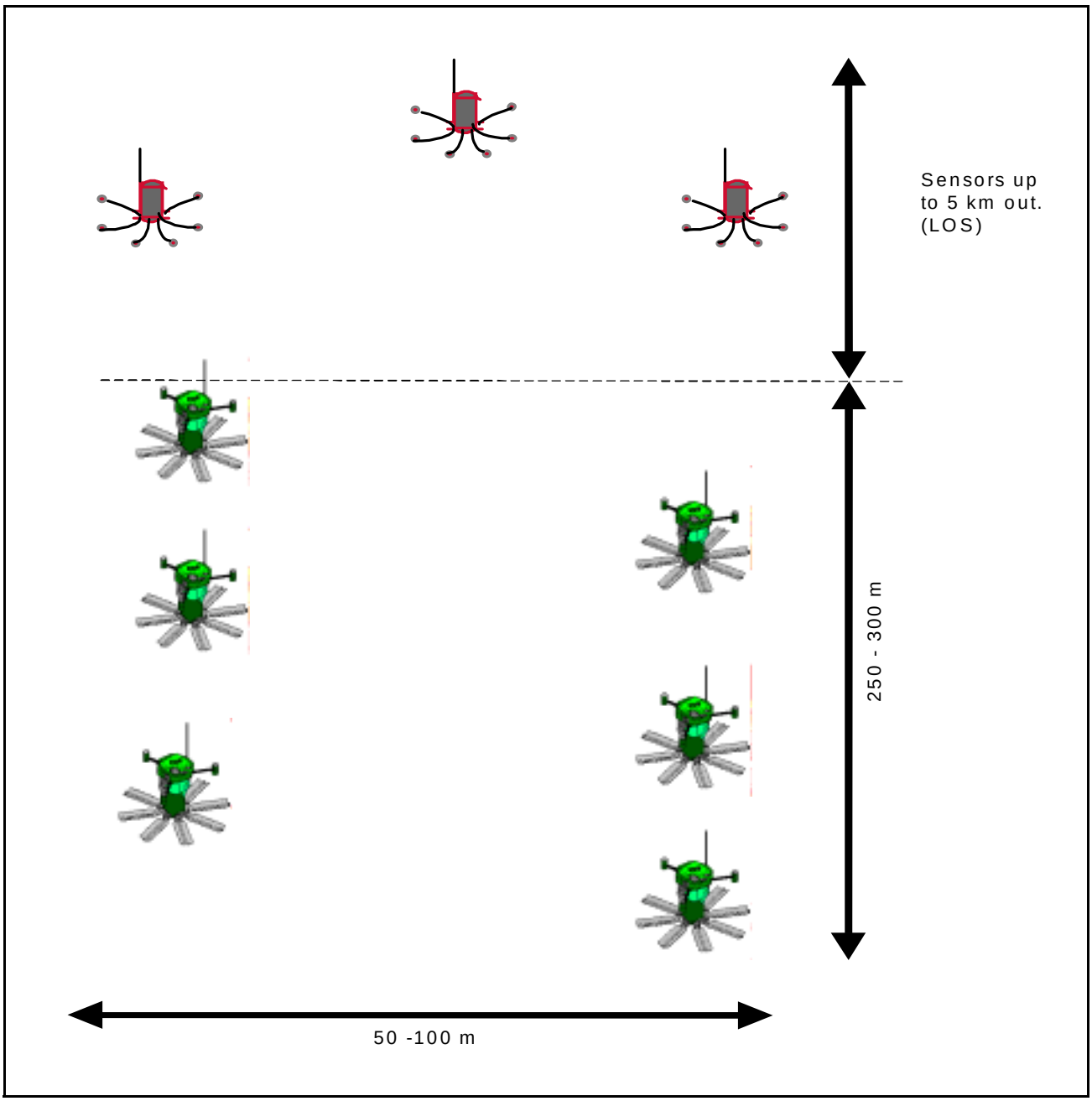

Figure F-9. Gauntlet pattern

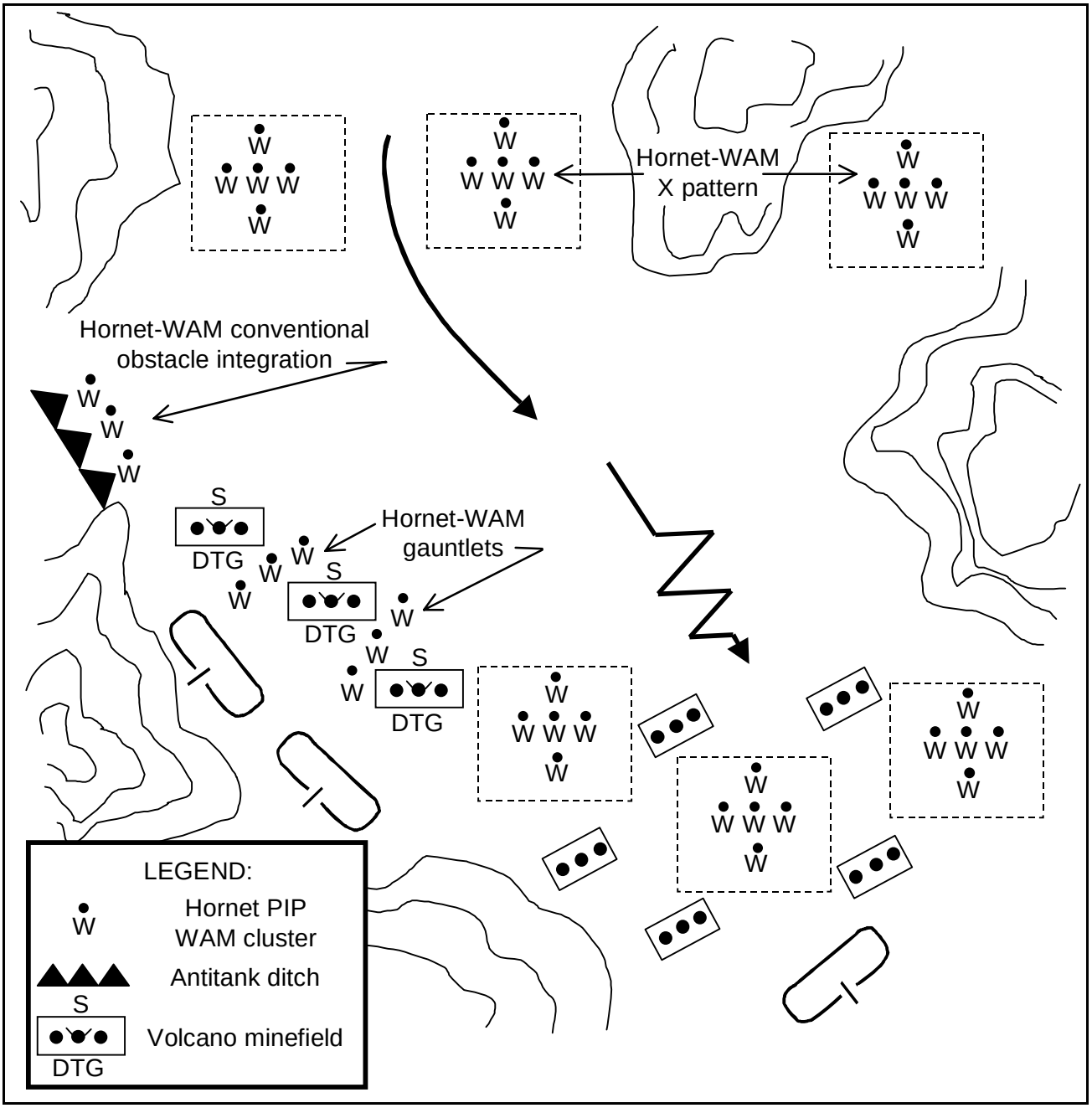

Figure F-10. Hornet PIP integrated with other types of obstacles

APPENDIX G

WARFIGHTER INFORMATION NETWORK (WIN)

This appendix provides a general overview of the WIN. This appendix specifically focuses on those FXXI systems that directly compliment or support the corps and division engineer staff officer and their staffs for planning, tactical decision-making, information sharing, and C2 of engineer operations during execution.

SYSTEMS CONCEPT OVERVIEW

The WIN is the integration of emerging and existing C4I technologies and concepts designed to increase the security, capacity, and velocity of information distribution throughout the battle space to gain information dominance. The WIN provides the deployed FXXI corps and division a communications framework that facilitates the electronic acquisition of information and its vertical and horizontal exchange between digital systems. Information security is maximized through the use of these digital systems and provides the warfighter the necessary tools to conduct FXXI operations. For example, these tools allow the warfighter to project, protect, gain information dominance, shape the battle space, conduct decisive operations, and sustain operations.

The WIN serves to enhance maneuver-force mobility by interlinking the various BOS to the ABCS. This concept of communication/ information services provides a force multiplier to the warfighter as current and future operations make greater demands on tactical voice, data, and multimedia signal-support systems.

To provide warfighters with key decision-making information, the various information systems are integrated into one homogeneous “system of systems” that encompasses the strategic, operational, and tactical levels as well as support of joint operations. Corps and below systems are shown in Figure G-1, page G-2. These include the: Global Command and Control System (GCCS), Standard Army Management Information System (STAMIS), Defense Message System (DMS), and ABCS.

The GCCS supports joint and strategic planners of all the services with a common system to manage and execute crisis and contingency operations and provide a means to interface to CINCs, services/agencies C4I systems for peacetime deliberate planning as well as crisis planning and execution. The GCCS is the realization of "C4I-for-the-Warrior" concept. The concept builds upon lessons learned from previous conflicts, operational requirements, and the effects of rapidly changing technology.

The warfighter requires a seamless information system where boundaries between functions and sources are erased. The GCCS provides the seamless, integrated information to the warfighter when, where, and how it is needed. This enhances warfighter effectiveness by driving interoperability through the elimination of duplicated functionality and the convergence of joint warfighter doctrine via GCCS's integration of common command, control, and intelligence (C2I) methods. The GCCS uses the secret Internet protocol network (SIPRNET) as its communications backbone.

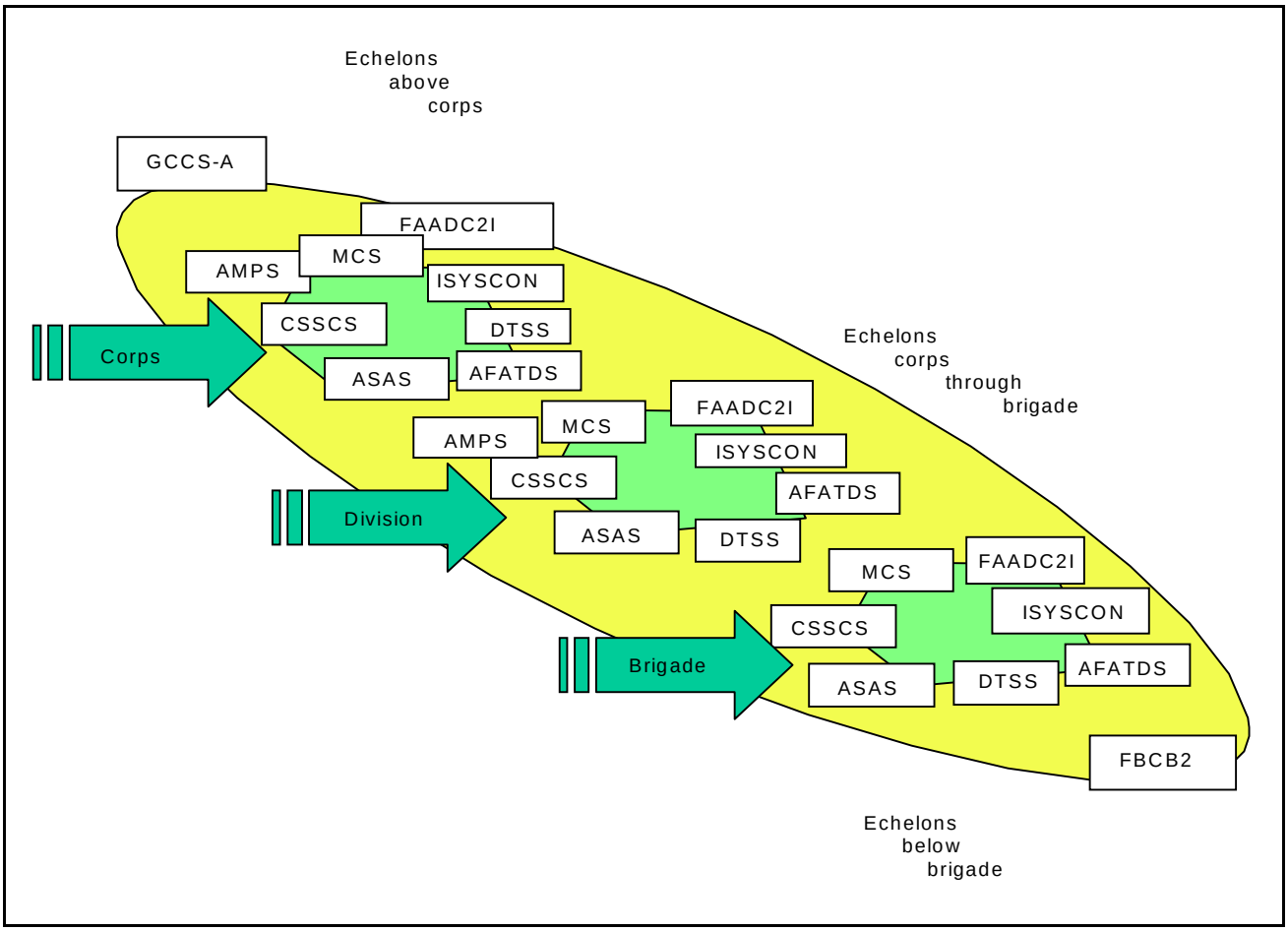

Figure G-1. WIN links in the corps's AO

The goals of the GCCS are—

- To provide, for all CINCCs, one affordable system that integrates across the services and functions to provide the warfighter with a single picture of the battle space.
- To migrate legacy applications to modern computing principles and technologies through the use of a common operating environment (COE).

To support these goals, the GCCS includes applications that provide efficient monitoring, planning, deployment, employment, and sustainment of military operations from the NCA to the commander, joint-task-force level.

The GCCS-Army (GCCS-A) supports Army strategic planners in the allocation, logistic support, and deployment of operational/tactical forces to the combatant commands. This in response to strategic planning and policy guidance provided by the NCA during crisis situations and operations from conventional conflict to stability and support operations. The Army Tactical Command and Control System (ATCCS) facilitates the integration of BOS operations. This speeds battle planning, COA development and tactical decision-making; enables timely coordination to synchronize and integrate operations properly; and facilitates the control of operational tempos during execution.

Above corps, the Standard Army Management Information System (STAMIS) is accessed by the CSSCS to resource separate logistical, medical, and personnel information management systems and provide a continues flow of information from the sustaining base through

the tactical level. These systems are currently not seamlessly integrated but are subsystems that reside on separate computer platforms. To bridge this gap, the GCSS-A initiative will fulfill the role of an integrated client/server system for all manning, arming, fixing, fueling, transporting, and sustaining support to the warfighter.

The DMS will be the single electronic-messaging system for all DOD fixed, mobile, strategic, and tactical environments. DMS will replace the automatic digital network (AUTODIN) and electronic mail (e-mail) messaging systems used today to provide greater services and eliminate current interoperability problems.

The ABCS will be the echelons corps and below (ECB) warfighter's primary information system to link strategic, operational, and tactical headquarters functionally. A more detailed discussion of its structure follows.

ARMY BATTLE COMMAND SYSTEMS

The ABCS is the over all umbrella of systems that make up the FXXI C4I architecture. It supports leaders and planners, at the tactical to the strategical level through an integrated digital information network. This network is designed to provide automated C2 and SA information through a seamless data architecture of existing and planned C2 systems. The ABCS includes the GCCS-A, the ATCCS, and the FBCB2 systems (see Figure G-2).

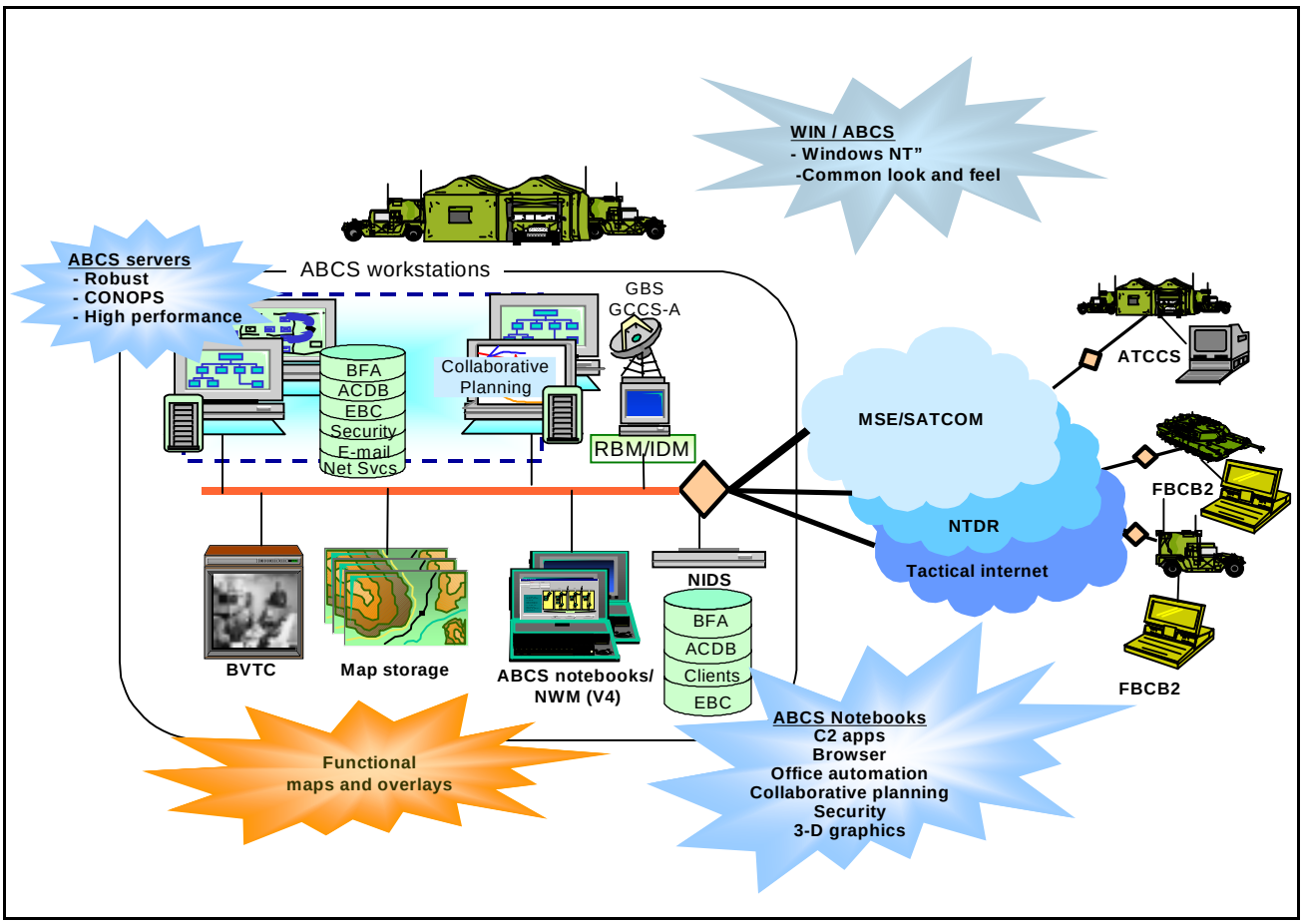

Figure G-2. ABCS

ARMY TACTICAL COMMAND AND CONTROL SYSTEM

At echelons from corps to company level, the ATCCS provides C2 and SA information to commanders and staffs. The ATCCS allows for the seamless integration of information to the warfighter, when, where, and how it is needed and provides the synchronization tools necessary to exchange information during operations. The ATCCS configuration utilized by the FXXI corps is the MCS, Advanced Field-Artillery Tactical-Data System (AFATDS), All- Source Analysis System- Remote Work Station (ASAS-RWS), Forward Area Air Defense Command, Control, and Intelligence system (FAADC2I), and CSSCS. These five ATCCS are compatible with many other ABCS systems that they utilize to obtain and pass information. Included in the ABCS configuration are the Warfighter Associate (WFA), Integrated Meteorological System (IMETS), the DTSS, the Aviation Mission Planning System (AMPS), and the FBCB2.

FBCB2

The FBCB2 system is a brigade and below battle space battle-command-information support system. It is supported by existing and emerging communications, sensors, and electrical power sources. This system is designed to be used by combat, CS, and CSS units across all BOS disciplines during tactical operations. The FBCB2 includes both embedded battle-command software and Appliqué tactical computer components.

BATTLEFIELD OPERATING SYSTEMS

Combined-arms team commanders and staffs exercise force-level control (FLC) by integrating and synchronizing the efforts of each BOS to support the mission. This is accomplished by managing information from individual BOS interests and developing tactical plans and orders based on that information. ABCS configuration assists FLC component systems (also known as battlefield automated system [BAS]) employed at ECB, by providing the ability to share information instantaneously. Significant strides have been made in the resolution of interconnectivity and interoperability problems between the various ABCS. The interconnectivity and interoperability achieved now provides the commanders and staff at corps and below the automated decision-support tools and information-gathering resources needed to develop SA and a common relevant picture of the battle space.

NOTE: The corps and division engineers primarily use the MCS-ENG function of the MCS to effect engineer planning and coordination and exercise C2 during mission execution. The MCS is located at the corps's, division's, and brigade's CPs engineer cells, (See Appendix F).

MANEUVER CONTROL SYSTEM

The MCS is the primary information system supporting the maneuver commander and staff. It provides the principal operational interface with necessary software applications and automated tools that are needed to access and manipulate the force-level databases resident on other BOSs / ABCSs that make battle planning and C2 more efficient. For example, the MCS operators can update their MCS database by "pulling" information from other BOSs / ABCS. These systems are interconnected via LAN or can receive information via free text, file-transfer protocol (FTP), or electronic messages through the TI. Based on an up-to-date database, the commander and staff are better able to forecast readiness states, execute timely tactical decisions, and quickly modify battle planning based on near real-time information, and expedite orders dissemination. The MCS consists of window and menu-based software allowing system operators to process, retrieve, store, and send information in textual or graphical form. Reports, OPORDs,

overlays, UTOs, and messages are available to the user.

ADVANCED FIELD-ARTILLERY TACTICAL-DATA SYSTEM

The AFATDS is an integrated fire-support (FS) C2 system that is capable of processing fire missions and related information to coordinate and maximize all FS assets. These assets include field artillery, mortar, attack helicopter, air support, naval gunfire, and offensive electronic warfare.

Fire missions are processed through the FS chain to the weapon system at the lowest echelon that can bring most effective fire on the target after the target-attack criteria are satisfied. This distributed processing capability allows the maneuver commander to influence the battle by placing the right mix of firing platform and munitions on enemy targets based on the commander's guidance and priorities.

The integration of all FS systems through the distributed processing capabilities of the AFATDS provides greater flexibility and mobility to FS units and allows greater management of critical resources. It provides current battle-space information, target analysis, and unit status and coordinates target damage-assessment coordination and sensor operations.

FORWARD AREA AIR DEFENSE COMMAND, CONTROL, AND INTELLIGENCE SYSTEM

The FAADC2I system is an integrated system of weapons, sensors, and C2. It protects maneuver forces, critical CPs, and CS and CSS elements from low-altitude air attack. It controls and integrates air-defence (AD) engagement operations and combined-arms force operations for AD elements. To support engagement operations, the FAADC2I system—

- Responds to air threats by integrating targeting functions, including sensor operations and AD weapons C2 functions.
- Acquires and tracks incoming air threats.
- Identifies friendly and enemy aircraft.
- Alerts forward AD weapons automatically.
- Assists battle managers in planning, coordinating, synchronizing, directing, and controlling the counter-air fight.
- Assists in developing and disseminating timely target data to all forward-area air-defense (FAAD) components.

ALL-SOURCE ANALYSIS SYSTEM — REMOTE WORK STATION

The ASAS-RWS is a functionally integrated intelligence support system. It manages sensors and other resources; collects, processes, and fuses intelligence data; stores, manipulates, and displays this data; and quickly disseminates information to the commander by providing a common picture of enemy activity.

The ASAS-RWS supports the commander's decision-making process 24 hours a day whether on the battle space or in rear support areas. It prioritizes and manages collection assets; processes, receives, and correlates data from strategic and tactical sensors and other sources to produce ground-battle situation displays. The system then disseminates intelligence information to assist the commander in refining that guidance, aids in target development, and provides recommendations.

COMBAT SERVICE SUPPORT CONTROL SYSTEM

The CSSCS is the logistics component of ATCCS and provides critical, timely, integrated, and accurate automated logistical information. This system provides information on all classes of supply, filed services, maintenance, medical services, and movements to the commanders and staffs. This information is consolidated and collated into situation reports and planning estimates for current and future operations.

The CSSCS provides a concise picture of a unit's requirements and support capabilities by collecting, processing, and displaying information on key items of supplies, services, and personnel that the commanders deem crucial to the success of an operation. Items tracked in the CSSCS represent a small portion of the items managed by STAMIS.

The CSSCS also supports the decision-making process with course-of-action (COA) analysis. Staffs can analyze up to three Coast for a 4-day period. Variables include combat intensity, combat posture, unit task organization, miles traveled, and geographical region.

The CSSCS maintains a database of unit personnel and equipment authorizations by source requirements code (SRC), similar to the table of organization and equipment (TOE) and the unit/equipment planning factors. The CSSCS includes a database of equipment and personnel called a baseline resource item list (BRIL). The items that a commander identifies as critical to the operation can be selected from the BRIL to establish the commander's cracked item list (CTIL).

This system currently provides situation awareness of critical elements within the following supply classes: Classes I, II/IV, III, III (P), V, VII, and VIII, and personnel-strength management. Maintenance, transportation, and medical functions are a few features to be added as the system matures.

ARMY AIRBORNE COMMAND AND CONTROL SYSTEM (A2C2S)

This is an UH-60 helicopter equipped with common networked computers, CNRs, radios, satellite communications (SATCOM), high frequency (HF) radios, and a digital map flat panel display to provide commanders from corps to maneuver levels a mobile C2 node for coordinating aviation support. The A2C2S has the capability to communicate and exchange information with aviation, maneuver, intelligence, FS, close air support, and any other elements similarly equipped.

AVIATION MISSION PLANNING SYSTEM

The AMPS is an automated aviation mission planning/rehearsal/synchronization tool that is designed specifically for the aviation commander. There are two levels of AMPS, brigade/battalion and company. Each level provides the automated capability to conduct aviation missions. The brigade/battalion AMPS is hosted on the Common Hardware/Software II (CHSII) platform. This consists of a tactical computer unit (TCU) with 128 megabytes (MB) of random access memory (RAM), a 4.2-gigabyte (GB) removable hard disk drive, a compact disc-read only memory (CD-ROM) drive, a 1.3-GB magneto optical (MO) drive, a 19-inch color monitor, and a character graphics printer. All of these components can be used in the field. Additionally the AMPS has an internal 9600-baud modem. The AMPS software contains a modem applet allowing two AMPSs to transfer data files over telephone lines. Longbow Apache and OH-58D Kiowa Warrior AMPSs have a data transfer receptacle and data cartridge for loading/downloading mission data in the aircraft. The AMPS will be found in the maneuver brigade's aviation cell.

IMPROVED DATA MODEM (IDM)

The IDM passes targeting or SA information to and from airborne or ground platforms (digital and analog). The IDM replaces the Airborne Target Handover System (ATHS) but retains backward compatibility with it. The IDM supports four links and one generic interface processor used for LINK/MESSAGE processing (link formats include tactical fire [TACFIRE] and Air Force applications program development [AFAPD]). The IDM provides digital connectivity between the Army, Air Force, and Marines that provide C4I data exchange for attack and reconnaissance helicopters, TOCs, CAS aircraft, and near real-time intelligence assets. It is designed to be hardware and software expandable and flexible. The IDM is used on the A2C2S, AH-64D,

and OH-58D Kiowa Warrior and in the aviation TOC (AVTOC). The Longbow Apache uses version 2.62 and all others use version 3.0. Version 3.0 includes internet controller (INC) functions allowing for data exchange with other INCs. Variable message format (VMF) messages are not currently capable of being interchanged between the two versions. Limited radio assets on airborne platforms require operators to switch to a maneuver-support net when providing CAS.

INTEGRATED METEOROLOGICAL SYSTEM

The IMETS provides a tactical, automated weather-data system for receiving, processing, and disseminating information to provide timely weather-environment effects, forecasts, and decision aids. The IMETS produces, displays, and disseminates weather forecasts and tactical decision aids that compare the impact of current, projected, or hypothesized weather conditions on friendly and enemy capabilities. The IMETS workstations are ATCCS common hardware and are interoperable with ASAS-RWS, DTSS, and other ATCCS BOSs over tactical and area communications.

DIGITAL TOPOGRAPHIC SUPPORT SYSTEM / QUICK RESPONSE MULTICOLOR PRINTER (QRMP)

The DTSS/QRMP is a mobile automated terrain-analysis system supporting battle space operations at division to echelons above corps. This system is located at the supporting engineer battalion TOC to provide digitized and hard-copy maps, terrain studies, photography, climatic summaries, weather forecasts and reports, and other data sources. It provides a geographic-information system to answer questions regarding terrain, mobility, bridges, and other geographic features using tables, maps, image files, and other products.

ATCCS CONFIGURATION

The physical configuration of an ATCCS's LANs varies with the information flow requirements at each echelon. However, the LAN's logical architecture remains the same throughout the system. This overview is essential for the engineer's basic understanding of requirements that he needs to operate a digital CP.

An ATCCS's LAN consists of multiple BOS component systems sharing the same LAN at a CP. The tactical packet network (TPN) serves as the communication link for the WAN which connects the various ATCCS's LANs across the battle space. While the CSSCS, AFATDS, FAADC2I, and ASAS-RWS BOS's component systems may also operate their own internal LANs for stovepipe communications, the ATCCS's LAN is the primary communications path for passing information horizontally between BOSs. Each ATCCS's LAN is a high-speed, short-distance network for computer-to-computer communications. It has an effective transfer rate of about 3 MB per second and is implemented with the Institute of Electrical and Electronics Engineers' (IEEE) 802.3 10-base LAN standard and a bus topology. Channel access is through carrier sense, multiple access/collision detection (CSMA/CD). The packet protocol is transport control protocol/Internet protocol (TCP/IP). The system is similar to the commercial Ethernet standard and the terms Ethernet, ThinLAN, and IEEE 802.3 10-Base2 are often used interchangeably. The TPN is also known as the mobile subscriber equipment (MSE) packet switch network, or MPN. The primary assets used for TPN communications include the node center (NC), small extension node (SEN), large extension node (LEN), and the system control center (SCC). These assets form the backbone of the tactical network linking the ATCCS's LANs (see Figure G-3, page G-8).

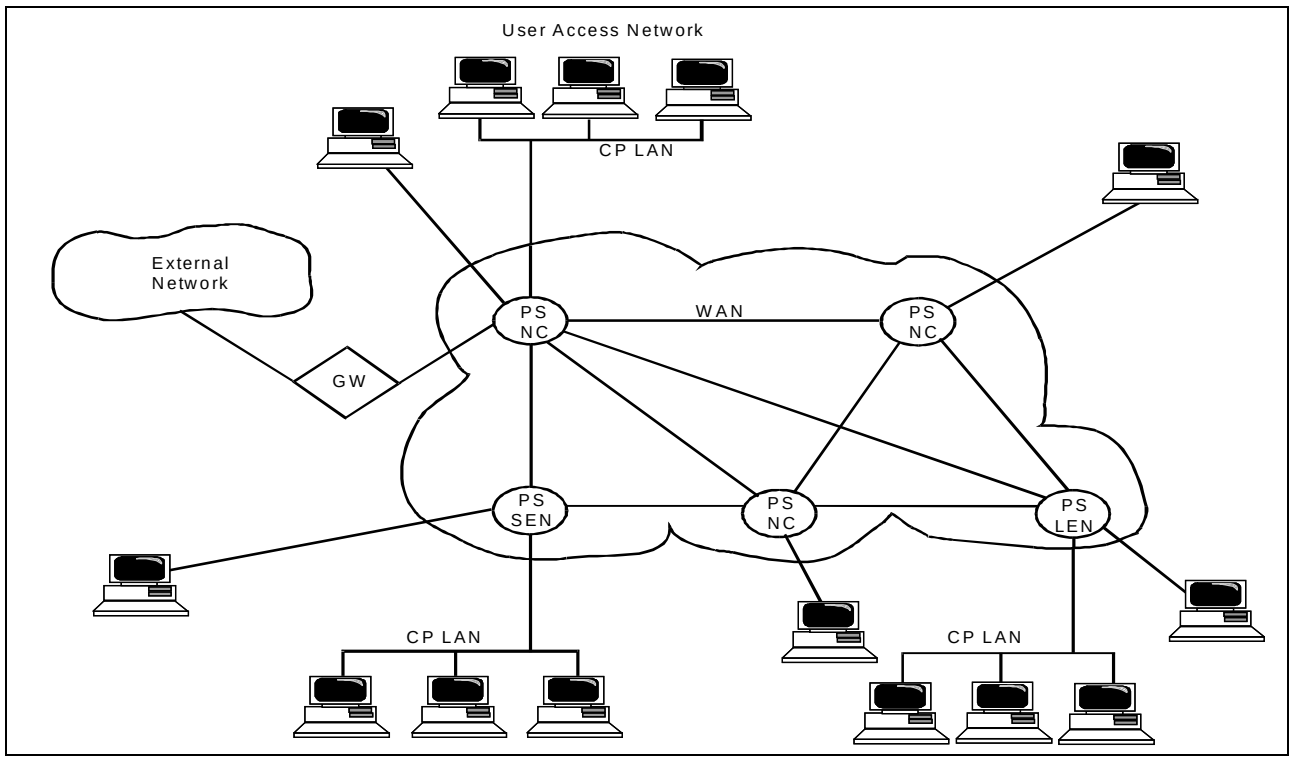

Figure G-3. Representative MSE architecture

COMMAND POST
COMMAND POST ATCCS TERMINAL ORGANIZATION

Terminal Definition

A terminal is a single device— a high-capacity computer unit (HCU), for example— used by a commander, staff member, or other authorized personnel (See Figure G-3).

Element Definition

An element is either a single terminal or several terminals connected on a LAN. An element is commonly known as an operational facility (OPFAC). It is under the functional CP system as described in FM 100-5. An element normally has a specific function such as the S1/S4 section located in the brigade or battalion trains.

Node Definition

A node is a group of one or more elements that support a BOS. It could also be a CP such as the maneuver brigade.

Unit Definition

A unit is a collection of nodes that support a military organization at a particular location (CP).

COMPUTATIONAL ENVIRONMENT

The ATCCS is arranged in a specific way to maximize the capabilities of each component. The systems used to do this are listed below:

- Distributed computing environmen (DCE).
- Data distribution system (DDS).
- X-Term.
- LAN.
- WAN.

Distributed Computing Environment

The basis of the DCE is the client-server relationship. A server is a HCU that is running server software. A client is an HCU that is running client software. A machine may thus act as a client in accomplishing one function but as a server in accomplishing another. The

server database is automatically updated from its clients. The server then updates other servers throughout the chain of command. This ensures that all unit databases remain current. In an ATCCS client-server configuration, each server can have multiple clients connected to it in a LAN. When a user on a client machine executes a specific application, the client requests the data from its connecting server. The software operates exactly the same on either machine, and the user cannot tell on which machine the software resides.

Due to the high workload in an ATCCS cell, no one HCU could handle the volume with all the applicable software provided by a client-server configuration and effectively run all required operations at a speed usable by operator. A client-server configuration provides this usable speed, however the disadvantage in this configuration is that if a server fails or if the LAN is broken, each client will only be able to perform the functions on its HCU until the LAN is reconfigured or repaired.

Through a process known as beaconing, the DCE, network, and system-administration workloads can be minimized, allowing greater automation of the DCE and network configurations. This process also allows for unique cell set up and identification of the DCE and network problems. beacon provides reconnection of client BOS component systems temporarily disconnected from the cell LAN without having them to reboot.

Data Distribution System

The DSS is the means by which database updates are replicated through the LAN or WAN. Data generated in one cell can be passed to all the other cells in the system, thereby providing all CPs with the same information, which includes tables, maps, reports and course of action white board conferences. The data is shared using MSE, tactical fiber-optic cable assemblies (TFOCA), coaxial cable, or CNR. The type of network used, limits the number of cells that can be connected together and the distance between cells. A coaxial LAN of the type used in the ATCCS is limited to 600 feet overall length, unless special hardware is used to extend the LAN. Each Standard Integrated Command Post System (SICPS) contains 50 feet of coaxial cable. A TFOCA network can extend to 1,600 feet overall length. There is ten feet of fiber-optic cable used in each SICPS. Weather and LOS conditions limit the radio network range. Data is sent between the cells by the DDS as a series of transactions. Each transaction is a single data record transmitted over the selected media. As the data-update traffic increases and the number of users on the network increases, the network load will increase.

X-Term

The X-Term is the means of access, through the X-Windows system, that other BOSs have into the MCS. The MCS user is affected by this action only by the time the HCU takes to complete a given task when the other BOSs update the database. An MCS user can work in one part of the MCS while another BOS accesses another part. Each user can complete his task without affecting the others. The system user/ administrator controls which BOS hosts have X-Term access.

Local Area Network

A LAN is a group of computers and related equipment connected together using data cables. In the ATCCS system, the type of data cable used is a 50-ohm coaxial cable or TFOCA. The TFOCA is used to connect a LAN when the distances between the LAN vehicles require a greater length (total LAN cable) than 600 feet, or when greater durability and data capacity are required. Any combination of an HCU, a lightweight computer unit (LCU), or a fiber-optic medium attachment unit (FOMAU), up to 30, can be connected on a LAN. Up to 100 FOMAUs can be connected in a fiber-optic ring. The fiber-optic cable will be connected in linear fashion from the first vehicle in the LAN to the last. The connection will effectively form a ring, since there are two paths within the cable. Optic signals will traverse each of the connec-

tions to the cable and then return to the source, (see Figure G-4).

Wide Area Network

A WAN is similar to a LAN but covers a larger distance. It is a network of networks that is constructed from a number of LANs connected to each other and to radio networks such as a CNR or an MSE. Because of the limitations of a network constructed with coaxial cable, a WAN uses a combination of the MPN and radio networks to distribute the a data where necessary, through the system.

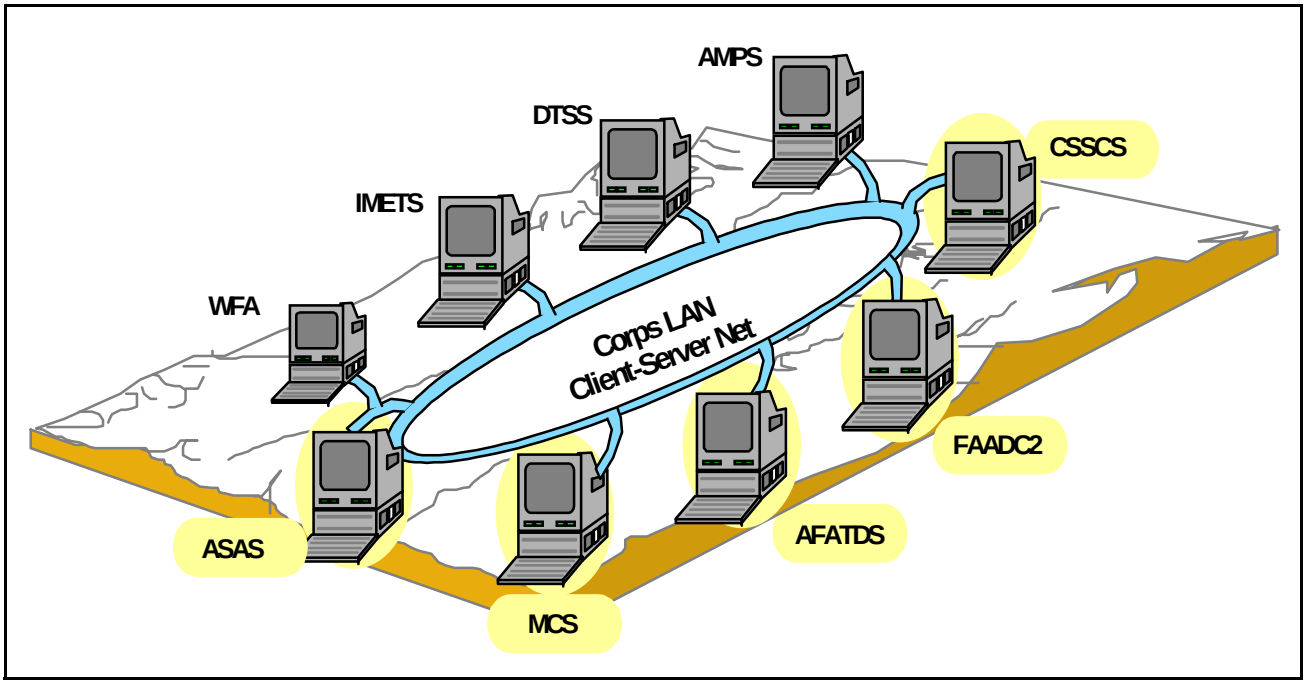

Figure G-4. Example of a FXXI corps TOC LAN

Glossary

1SG	first sergeant
2IC	second in command
A&O	assault and obstacle
A2C2	Army airspace command and control
A2C2S	Army Airborne Command and Control System
AAFS	Amphibious Assault Fuel System
ABCS	Army Battle Command System
ACDB	Army Common Data-Base
ACE	analysis and control element
ACE	armored combat earthmover
ACE	assistant corps engineer
ACUS	area common user system
AD	air defense
ADA	air defense artillery
ADC	area damage control
ADC-S	assistant division commander for support
ADDS	automated data-distribution system
ADE	assistant division engineer
ADP	automated data processing
AE	assault echelon
AFAPD	Air Force applications program development
AFATDS	Advanced Field-Artillery Tactical Data System
AFCS	Army Facilities Components System
AFCT	aircraft
AFFOR	Air Force forces
AFOE	assault follow-on echelon
AG	adjutant general
AHD	antihandling device
AI	air interdiction
AI	artificial intelligence
AIR DET	air detachment
AISN	Army Information Systems Network
ALOC	administrative logistics operations center
ALOC	air lines of communication
AM	airfield matting
AMCI	Army and Marine Corps Integration
ammo	ammunition
AMPS	Aviation Mission Planning System
ANG	Air National Guard
AO	area of operations
AOA	amphibious objective area
AOR	area of responsibility
AOS	acoustical overwatch sensor
APOD	aerial port of debarkation
APOE	aerial port of embarkation
Applique	brigade and below command and control system

AR	Army regulation
ARFOR	Army forces
ARNG	Army National Guard
arty	artillery
ASAS	All-Source Analysis System
ASAS-RWS	All-Source Analysis System—Remote Workstation
ASG	area support group
ASOC	air support operations center
ASP	ammunition supply point
ASR	alternate supply route
ASTAMIDS	Airborne Standoff Mine/Minefield Detection and Survey System
ATCCS	Army Tactical Command and Control System
ATACMS	Army tactical cruise missile system
ATHS	Airborne Target Handover System
ATK	attack position
ATMCT	air terminal movement control team
ATP	ammunition transfer point
ATTE	assistant theater topographic engineer
ATTN	attention
AUTODIN	automatic digital network
AV	aviation
AVIM	aviation intermediate maintenance
AVLB	armored vehicle launched bridge
AVTOC	aviation tactical operations center
AWE	advanced warfighting experiment
BAS	battlefield automated system
BB	bare base
BCC	battlefield circulation control
BCE	base civil engineer
BCOC	base cluster operations center
BCT	brigade combat team
BDA	battle damage assessment
BDAR	battle damage assessment and repair
bde	brigade
BDOC	base defense operations center
BFA	battlefield functional area
BHL	battle handover line
BMMC	Brigade Material Management Center
bn	battalion
BOS	battlefield operating system
br	branch
BRIL	baseline resource item list
BSA	brigade support area
BSO	brigade signal officer
BVTC	battlefield video teleconferencing
C2	command and control
C2I	command, control and intelligence
C2V	command and control vehicle
C4I	command, control, communications, computers, and intelligence
CA	civil affairs

CA	combat assessment
CAA	combined-arms army
CAC	crossing-area commander
CAE	crossing-area engineer
CALL	center for Army lessons learned
CAS	close air support
CATF	Commander, Amphibious Task Force
CATK	counterattack
CAV	cavalry
CB	construction battalion
CBMU	construction battalion maintenance unit
cbt	combat
CBU	construction battalion unit
CCF	Chinese Communist Forces
CCIR	commanders critical information requirements
CDOCC	corps deep operations coordination cell
cdr	commander
CD-ROM	compact disc-read only memory
CEB	Combat Engineer Battalion
CEC	combat engineer company
CEV	combat engineer vehicle
CFC	crossing -force commander
CFE	crossing - force engineer
CGSC	Command and General Staff College
CHSII	Common Hardware/Software II
CINC	Commander In Chief
CINCLANTFLT	Commander in Chief, Atlantic Fleet
CINCPACFLT	Commander in Chief, Pacific Fleet
CIRCE	countermobility remote control unit
Class I	A category of supply which includes meals and rations.
Class II	A category of supply which includes consumables/expendables.
Class III	A category of supply which includes petroleum, oils, and lubricants.
Class IV	A category of supply which includes construction and barrier materials.
Class V	A category of supply which includes ammunition.
Class VI	A category of supply which includes sundry packs.
Class VII	A category of supply which includes end items.
Class VIII	A category of supply which includes medical material.
Class IX	A category of supply which includes repair parts and components.
classes of supplies	The grouping of supplies, by type, into 10 categories to facilitate supply management and planning.
CMCC	corps movement control center
cmd	command
CMD/CIC	command/combat information center
CMMC	Corps Materiel Management Center
CNR	combat net radio
co	company
COA	course of action
COB	collocated operating base
COE	common operating environment
COMCBLANT	Commander, Naval Construction Battalions, US Atlantic Fleet

COMCBPAC	Commander, Naval Construction Battalions, US Pacific Fleet
coml	commercial
COMMZ	communications zone
CONPLAN	contingency plan
const	construction
CONUS	continental United States
COR	contracting officer's representative
COSCOM	corps support command
CP	command post
CPOC	corps personnel operations center
CREST	contingency real estate support team
CS	call sign
CS	combat support
CSA	corps storage area
CSB	corps support battalion
CSC	corps support company
CSE	combat support equipment
CSG	corps support group
CSH	combat support hospital
CSM	command sergeant major
CSMA/CD	carrier sense, multiple access/collision detection
CSR	controlled supply rate
CSS	combat service support
CSSCS	Combat Service Support Control System
CTIL	commander's tracked item list
D+	day of an operation
D-Day	commencement of operations
DA	Department of the Army
DAC	disaster assistance center
DAWE	division XXI advanced warfighter experiment
DBC	deputy brigade commander
DCE	distributed computing environment
DCG	deputy commanding general
DCRU	disaster control and recovery unit
DCS	defence communication system
DDMP	deliberate decision-making process
DDS	data distribution system
den	dental activity
dep	deputy
DISCOM	division support command
DISN	Defense Information Systems Network
div	division
DMA	Defense Mapping Agency
DMMC	Division Materiel Management Center
DMS	Defense Message System
DOD	Department of Defense
DODD	Department of Defense directive
DP	decision point
DPW	Directorate of Public Works
DRS	Digital Reconnaissance System

DS	direct support
DSA	division support area
DSB	division support battalion
DSES	division staff engineer section
DSSU	direct-support supply unit
DST	decision support template
DSU	direct-support unit
DTED	digital terrain-elevation data
DTG	date-time group
DTSS	Digital Topographic Support System
DX	direct exchange
DXA	direct-exchange activity
E&S	engineering and services
EA	engagement area
EAC	echelons above corps
EAD	echelons above division
EBA	engineer battlefield assessment
EBC	embedded battle command
ECB	echelons corps and below
EEEI	essential elements of engineer intelligence
EEMO	engineer equipment maintenance officer
EGA	enhanced graphics adapter
e-mail	electronic mail
ENCOM	engineer command
ENGDATAREP	engineer data report
engr	engineer
ENGREP	engineer report
ENGSITREP	engineer situation report
ento	entomology
EOD	explosive ordnance disposal
EPLRS	Enhanced Position Location Reporting System
EPW	enemy prisoner of war
equip	equipment
ESB	engineer support battalion
ESC	engineer support company
evac	evacuation
EW	electronic warfare
EWL	engineer work line
EXFOR	experimental force
FA	field artillery
FAA	forward assembly area
FAAD	forward area air defense
FAADC2I	Forward-Area Air-Defense Command, Control, and Intelligence System
FACE	forward aviation combat engineering
FARP	forward area rearm/refuel point
FBCB2	Force XXI Battle Command – Brigade and Below
FEBA	forward edge of the battle area
fld	field
FLC	force-level control
FLOT	forward line of own troops

FLS	forward landing strip
FM	field manual
FM	frequency modulated
FMFM	Fleet Marine Force manual
FMSP	Foreign Military Sales Program
FOL	forward operating location
FOMAU	fiber-optic medium attachment unit
FRAGO	fragmentary order
freq	frequency
FS	fire support
FSB	forward support battalion
FSCOORD	fire-support coordination officer
FSE	fire-support element
FSSG	force service support group
FTP	file transfer protocol
fwd	forward
FXXI	Force XXI
G1	Assistant Chief of Staff, G1 (Personnel)
G2	Assistant Chief of Staff, G2 (Intelligence)
G3	Assistant Chief of Staff, G3 (Operations)
G4	Assistant Chief of Staff, G4 (Logistics)
G5	Assistant Chief of Staff, G5 Civil Affairs
G6	Corps/Division Assistant G6 Chief of Staff, Signal
Gator	air-delivered scaterable mine
gb	gigabyte
GBS	global broadcast service
GCCS	Global Command and Control System
GCS	Gateway Control Station
GCSS-A	Global Combat Support System- Army
gp	group
grp	group
Grizzly	heavy force complex obstacle breacher
GS	general support
GSSU	general-support supply unit
GSU	general-support unit
GW	Gateway
H&S	headquarters and services
H	start of an operation
HCU	high capacity computer unit
HE	high explosive
HEMTT	heavy expanded mobility tactical truck
HF	high frequency
HHC	headquarters and headquarters company
HHD	headquarters and headquarters detachment
hldg	holding
HMMWV	high-mobility multipurpose wheeled vehicle
Hornet	antitank/antivehicular off-route munition
HPT	high-payoff target
HQ	headquarters
HVT	high-value target

hvy	heavy
IO	information operations
I&W	intelligence and warning
ICO	intelligent combat outpost
IDM	improved data model
IEEE	Institute of Electronic Engineers
IMETP	International Military Education and Training Program
IMETS	Integrated Meteorological System
IMF	intelligence minefield
Inc	incorporated
INC	internet controller
info	information
intel	intelligence
INTSUM	intelligence summary
IPB	intelligence preparation of the battlefield
IREMBASS	Improved Remotely Monitored Battlefield Sensor System
ISB	intermediate staging base
ISS	information system security
ISYSCON	integrated systems control
J2	Intelligence Directorate
J3	Operations Directorate
J4	Logistics Directorate
JMCC	joint movement control cell
JPO	joint petroleum office
JSOP	joint services operations plans
JSTARS	Joint Surveillance and Target Attack Radar System
JTF	joint task force
LAD	latest arrival date
LAN	local area network
Land Warrior	digitized dismounted soldier system
LAPES	low altitude parachute extraction system
LBA	Longbow Apache
LC	line of contact
LCU	lightweight computer unit
LD	line of departure
LE	light equipment
LEN	large extension node
LFSP	landing-force support party
LO	liaison officer
LOA	limit of advance
LOC	line of communication
LOGCAP	logistics civil augmentation program
LOGPAC	logistics package
LOGSTAT	logistics status report
LOS	line of sight
LOTS	logistics over the shore
LRP	logistics regulating point
LSA	life-support area
LSA	logistics support area
LSC	life-support center

lt	light
m	meter (s)
MACOM	major Army command
MAGTF	Marine Air-Ground Task Force
maint	maintenance
MARFOR	Marine Corps forces
MASF	medical air support facility
MASH	mobile army surgical hospital
MB	megabyte
MBA	main battle area
MC&G	mapping, charting, and geodesy
MCC	movement control center
MCL	minimum class load
MCL	mission configured load
MCOO	modified combined obstacle overlay
MCS	Maneuver Control System
MCS-ENG	Maneuver Control System - Engineer
MCT	movement control team
MEB	marine expeditionary brigade
med	medical
MEF	marine expeditionary force
METT-T	mission, enemy, terrain, troops and time available
MEU	marine expeditionary unit
MGB	medium girder bridge
MI	military intelligence
MICLIC	mine-clearing line charge
MKT	mobile kitchen trailer
MLRS	Multiple-Launch Rocket System
mm	millimeter (s)
MO	magneto optical
MOADS	Maneuver-Oriented Ammunition Distribution System
MOB	main operating base
MOG	maximum on ground
MOPMS	modular pack mine system
MOPP	mission-oriented protective posture
MOS	military occupational specialty
MOUT	military operations on urbanized terrain
MP	military police
MPF	maritime pre-positioning force
mph	mile (s) per hour
MPN	MSE packet switch network
MQS	military qualifications standards
MRD	motorized rifle division
MRT	movement regulating team
MSB	main support battalion
MSC	major subordinate command
MSE	mobile subscriber equipment
MSR	main supply route
MST	maintenance support team
MTC	movement to contact

MTS	movement tracking system
mvmt	movement
MWR	morale, welfare, and recreation
MWRS	morale, welfare, recreation and services
NAI	named area of interest
NATO	North Atlantic Treaty Organization
NAV	navigation
NAVFOR	Navy forces
NBC	nuclear, biological, chemical
NBG	naval beach group
NC	node center
NCA	National Command Authority
NCB	naval construction brigade
NCF	naval construction force
NCFSU	naval construction force support unit
NCO	noncommissioned officer
NCR	naval construction regiment
NCS	net control station
NIDS	network intrusion detection system
NEO	noncombatant evacuation operation
NICP	national inventory control point
NIMA	National Intelligence Mapping Agency
NKPA	North Korean People's Army
NMC	non-mission capable
NMCB	naval mobile construction battalion
No.	number
NSE	Naval support element
NT	new technology
NWM	network manager
O/I	operations and intelligence
O/O	on order
OBJ	objective
OBSTINTEL	obstacle intelligence
OCOKA	observations and filed of fire, cover and concealment, obstacles, key terrain, and avenues of approach
OIC	officer in charge
OOTW	operations other than war
OP	observation post
OPCOM	operational command
OPCON	operational control
OPFAC	operational facility
OPLAN	operation plan
opns	operations
OPORD	operation order
ops	operations
OPSEC	operations security
OPTEMPO	operations tempo
ORA	obstacle-restricted area
org	organization
OS	over-watching sensor

P	package
PB	panel bridge
PDO	Property Disposal Office
PDS	personnel daily summary
PEO	peace-enforcement operation
PERREP	personnel report
PERSCOM	Personnel Command
petrl	petroleum
PHIBCP	amphibious construction battalion
PIP	product improvement program
PIR	priority intelligence requirements
PKO	peacekeeping operation
PL	phase line
PLS-E	Pelletized Loading System-Enhanced
plt	platoon
PM	preventive maintenance
POC	point of contact
POD	port of debarkation
POE	port of embarkation
POL	petroleum, oils, and lubricants
POS	position
POS/NAV	position/navigation
PP	passage point
prep	preparation
Prime BEEF	Prime Base Engineer Emergency Force
Prime RIBS	Prime Readiness in Base Support
PS	packet switch
PS	personnel services
PSN	packet switch network
PSYOP	psychological operations
pt	point
pts	parts
QRMP	quick-response multicolor printer
qty	quantity
Quickfix	rotary wing SIGINT Collection Platform
R&S	reconnaissance and surveillance
RAM	random access memory
RAOC	rear area operations center
Raptor	an integrated munitions, sensor, computer, and communication monitoring obstacle system
RB	ribbon bridge
RBM	receive-broadcast management
RCP	relevant common picture
RCEM	regional contingency engineer manager
recon	reconnaissance
REDCON	readiness condition
RED HORSE	Rapid Engineer Deployable Heavy Operational Repair Squadron, Engineer
rep	repair
repl	replacement

RH	RED HORSE
RISTA	reconnaissance, intelligence, surveillance, and target acquisition
RMMC	Regiment Material Management Center
ROE	rules of engagement
ROK	Republic of Korea
ROM	read only memory
RP	release point
RPMA	real property maintenance activities
rqr	required
RRP	replacement regulating point
RRR	rapid runway repair
RS&O	reception, staging, and onward movement
RSR	required supply rate
RTF	regeneration task force
RTOC	rear tactical operations center
RWS	remote work station
/s/	signature
S&S	supply and service
S1	Adjutant (US Army)
S2	Intelligence Officer (US Army)
S3	Operations and Training Officer (US Army)
S4	Supply Officer (US Army)
S5	Civil Affairs Officer (US Army)
S6	Communications Officer (US Army)
SA	situational awareness
SA	staging area
SALUTE	size activity location unit time and equipment
sani	sanitation
SATCOM	satellite communications
SATP	Security Assistance Training Program
SB	standby base
SCATMINE	scatterable mine
SCC	system control center
sec	section
SEE	small emplacement excavator
SEN	small extension node
SES	staff engineer section
SICPS	Standard Integrated Command Post System
SINCGARS	Single Channel Ground and Airborne Radio System
SIP	System Improvement Program
SIPRNET	secret Internet protocol network
SITREP	situation report
SJA	Staff Judge Advocate
SME	subject-matter expert
SOF	special operations forces
SOFA	Status of Forces Agreement
SOI	signal operating instructions
SOP	standing operating procedure
SOSR	suppression, obscuration, security, and reduction
SP	start point

SPCE	survey planning and coordination element
SPOTREP	spot report
spt	support
sptd	supported
SRC	source requirement code
STAMIS	Standard Army Management Information System
STANAG	standardization agreement
STON	short ton
STP	soldier training publication
STU-III	secure telephone unit third generation
sup	supply
TA	target acquisition
TA	theater Army
TAA	tactical assembly area
TAACOM	Theater Army Area Command
TAC	tactical
TACCS	Tactical Army Combat Service Support Computer System
TACFIRE	tactical fire
TACGEN	tactical generator
TACON	tactical control
TAFDS	Tactical Airfield Fuel Distribution System
TAI	target area of interest
TAMMC	Theater Army Material Management Center
TAPOC	theater Army personnel operations center
TAV	total asset visibility
TC	training circular
TCF	tactical combat force
TCMS	Theater Construction Management System
TCP/IP	transmission control protocol/Internet protocol
TCU	tactical computer unit
TDMP	tactical decision-making process
TEC	Topographic Engineering Center
TEM	terrain evaluation model
TERRABASE II	terrain visualization and imagery database
TF	task force
TFOCA	tactical fiber optic cable assemblies
TFXXI	Task Force XXI
THREATCON	threat condition
TI	tactical Internet
TLP	troop-leading procedure
TMT	transportation medium truck
TO	theater of operations
TOC	tactical operations center
TOE	table of organization and equipment
TRADOC	US Army Training and Doctrine Command
TPFDD	time-phased force deployment data
TPN	tactical packet network
TPTRL	time-phased transportation requirements list
trans	transportation
trk	truck

TSA	US Army troop support activity
TTP	tactics, techniques, and procedures
TTP	terminal transfer point
U&S	unified and specified
UAV	unmanned airborne vehicle
UCT	underwater construction team
UHF	ultra high frequency
UN	United Nations
US	United States
USACE (FWD)	forward-deployed USACE command
USACE	United States Army Corps of Engineers
USAES	United States Army Engineer School
USAID	United States Agency for International Development
USAR	United States Army Reserves
USGS	United States Geological Survey
UXO	unexploded ordnance
V4	version 4
VET	veterinary
VMF	variable message format
VTC	video teleconference
VTOL	vertical takeoff and landing
w/	with
WAM	wide-area munition
WAN	wide-area network
WARNORD	warning order
WFA	Warfighter Associate
WIN	Warfighter Information Network
WRSK	war readiness spares kit
XO	executive officer

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